MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for January, 1901, is based on reports from about 3,100 stations furnished by employees and voluntary observers, classified as follows: regular stations of the Weather Bureau, 159; West Indian service stations, 13; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,562; Army post hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Railway Company, 96; Canadian Meteorological Service, 32; Mexican Telegraph Service, 20; Mexican voluntary stations, 7; Mexican Telegraph Company, 3. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Commander Chapman C. Todd, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San Jose, Costa Rica; Captain François S. Chaves, Director of the Meteorological Observatory, Ponta Delgada, St. Michaels, Azores, and W. M. Shaw, Esq., Secretary, Meteorological Office, London.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′ or $10^h\ 30^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now always reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

On January 7, 1901, daily forecasts of the direction and force of the wind for the transatlantic steamer tracks west of the fortieth meridian were regularly begun. These forecasts cover the first three days of the passage of steamers eastward bound from United States ports. When the conditions presented by Atlantic and western European reports will permit, forecasts of severe storms in the transatlantic track will be issued for the benefit of vessels about to leave European ports. Forecasts will also be issued in connection with American storms of marked severity when their course to European waters can be calculated.

The storms of January, 1901, were unusually severe over the north Atlantic ocean. During the first ten days of January the barometer was abnormally high over north-central and west-central Europe, and abnormally low over the Mediterranean. This distribution of pressure was attended by exceptionally low temperature over southern Europe and temperature above the seasonal average over northern Europe. During the same period the barometric pressure was unusually low, and severe gales continued over the middle Atlantic ocean, while over the western part of the Atlantic fair weather prevailed. During the second decade of the month heavy gales continued over mid ocean; on the 12th, 16th, and 17th, the pressure was very low over the British Isles; during this period several severe storms advanced eastward from the American Continent. From the 20th to the close of the month severe storms occurred over the eastern and western portions of the north Atlantic, while over mid ocean the barometer continued generally high. The conditions which prevailed, and the severe gales which occurred over the western Atlantic, were accurately covered by the special daily forecasts of the Weather Bureau.

Severe gales prevailed along and off the Pacific coast of the United States during the first half of month. Due warning was given of the occurrence of these gales by the Weather Bureau offices at San Francisco, Cal., and Portland, Oreg.

During the stormy period of the first half of the month in the Pacific coast States unusually heavy falls of snow delayed trains and interrupted telegraphic communication. In parts of central and southern California the snowfalls of the month were the heaviest in years.

Moderate temperatures for the season prevailed generally east of the Pacific coast States. On the 2d killing frost occurred in central California, and at San Luis Obispo the minimum temperature, 24°, was the lowest on record at that place. On the 9th frost occurred generally throughout southern California. On the 18th special warnings of continued low temperature and strong north winds, with snow in the mountain

districts, were sent to Arizona. Commenting upon the forecasts of the early part of the month, the Riverside, Cal., Independent, of January 9, 1901, remarks editorially as follows:

> The Weather Bureau's reports and predictions this season so far have been remarkably accurate, and their value can hardly be overestimated.

Frosts occurred at intervals during the month in the Gulf and extreme south Atlantic coast districts. In each instance all interests in the districts referred to received timely and accurate forecasts and warnings of approaching frost or freezing weather.

From the 8th to the 20th heavy rain and melting snow caused freshets and floods in the rivers of the Pacific coast States. During the second decade of the month rapid rises occurred in the Coosa, Alabama, and Tennessee rivers. Warnings were sent well in advance of the flood crests, and were of great benefit to property interests affected by the rapid rise in the rivers.

CHICAGO FORECAST DISTRICT.

With the exception of a cold wave which overspread the district on the 1st of January, for which warnings had been sent out well in advance, the month was marked by moderate temperature. On two or three occasions later in the month cold waves appeared in the Northwest, but they lost force before extending over a large part of the district.

There were some moderate snowfalls during the month but no warnings of heavy snows were issued.

Advisory messages were sent to all open ports on Lake Michigan several times when high winds threatened. No casualties on the lakes were reported during the month.—*H. J. Cox, Professor.*

SAN FRANCISCO FORECAST DISTRICT.

On January 1 special warnings of heavy frost were sent to fruit growers in southern California. On the morning of the 2d killing frosts were reported in central California, and a minimum of 24° was reported at San Luis Obispo. Frost warnings were issued on the 9th for southern California, and citrus fruit growers were warned to smudge vigorously. Heavy frosts were reported at nearly every point, with ice at some stations. Warnings or advisory messages regarding gales were telegraphed to coast stations during the early part of the month; on the morning of the 3d unusually high winds occurred at many points in California. At San Francisco a maximum wind velocity of 56 miles an hour was registered. Shipping interests had been well informed of the approach of the storm, and probably the small list of casualties is due in some measure to precautions taken, based upon warnings given.—*A. G. McAdie, Forecast Official.*

PORTLAND, OREG., FORECAST DISTRICT.

The first half of the month was especially noteworthy for the large amount of snow which fell in the mountains of southern Oregon. During this period severe storms occurred at sea, but in every instance warnings were issued in ample time to be of benefit, and no marine disasters, due to high winds, are known to have occurred during January. Heavy rains and melting snow in the foothills resulted in a small freshet in the Willamette River and tributaries between the 13th and 20th of the month. River forecasts were issued twice a day during the freshet, and while considerable damage was done in the streams above Portland to log rafts, small bridges, etc., at Portland the damage was small and consisted principally of money expended in hiring extra labor to remove goods from cellars and wharfs to higher places. The maximum stage reached at Portland was 20.9 feet on the 17th. This stage at Portland would, if unannounced, result in damaging goods stored in cellars and on low wharfs to the extent of nearly, if not quite, a million dollars, but in this instance the damage was not worth noting, and this state of affairs was largely due to the flood warnings which were sufficiently reliable to enable nearly every one to remove his goods before the water reached them.—*Edward A. Beals, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	3, a. m.	53	108	6, p. m.	39	75	1,975	2.5*	790	32.9
II	5, p. m.	51	114	8, a. m.	39	75	2,100	2.5	840	35.0
III	7, p. m.	51	114	11, a. m.	47	65	2,325	3.5	664	27.7
IV	11, p. m.	32	96	13, a. m.	39	82	950	1.5	633	26.4
V	16, a. m.	54	114	17, a. m.	47	101	750	1.0	750	31.2
VI	18, a. m.	28	97	20, p. m.	32	65	2,375	2.0†	1,188	49.5
VII	20, p. m.	48	115	23, a. m.	46	60	2,900	2.5	1,160	48.3
VIII	22, p. m.	46	123	26, a. m.	39	82	2,625	3.5	750	31.2
IX	31, p. m.	30	91	2, a. m.‡	30	82	2,250	3.5	643	26.9
							925	1.5	617	25.7
Sums							19,175	24.0	8,035	334.8
Mean of 10 paths							1,918		804	33.5
Mean of 24 days									799	33.3
Low areas.										
I	5, a. m.	48	125	10, a. m.	48	54	4,025	4.0*	1,006	41.9
II	5, p. m.	38	105	7, p. m.	45	67	2,250	2.0	1,125	46.9
III	8, a. m.	45	118	10, p. m.	43	78	2,225	2.5	890	37.1
IV	8, p. m.	33	106	14, a. m.	48	54	3,325	5.5	605	25.2
V	10, p. m.	48	125	12, a. m.	50	97	1,450	1.5	967	40.3
VI	12, a. m.	48	125	15, a. m.	46	82	2,200	3.0	733	30.5
VII	13, a. m.	53	122	19, a. m.	48	54	3,750	6.0	625	26.0
	14, p. m.	49	110				3,200	4.5	711	29.6
	17, a. m.	37	80				1,725	2.0	862	35.9
VIII	17, a. m.	54	114	19, a. m.	42	75	2,900	2.0	1,100	45.8
IX	18, p. m.	53	114	22, a. m	48	54	2,825	3 5	807	33.6
	19, p m.	54	114				3,000	2.5	1,200	50.0
	21, p. m.	54	114				4,375	8.5	515	21.5
X	22, a. m.	20	76	30, a. m.	45	55	3,300	8.0	412	17.2
	23, a. m.	35	98				3,150	7.0	450	18.8
XI	24, a. m.	53	122	26, p. m.	48	85	1,775	2.5	710	29.6
XII	25, a. m.	34	112	26, p. m.	35	95	1,150	1.5	767	32.0
XIII	27, p. m.	54	114	1, a. m.‡	42	60	3,875	4.5	861	35.9
	27, a. m.	33	118				3,500	5.0	700	29.2
	29, a. m.	26	97				2,475	3.0	825	34.4
Sums							55,775	79.0	15,871	661.4
Mean of 20 paths							2,789		794	33.1
Mean of 79 days									706	29.4

*Stationary for 1 day. †Stationary for half day. ‡February.

RIVERS AND FLOODS.

With the exception of the Tennessee and Cumberland, the rivers of the Mississippi system were lower than during December, 1900, though not decidedly so. Below Cairo, Ill., the Mississippi River fell during the first half of the month, but was considerably higher during the last half, a rise from the Ohio reaching it on the 13th.

Low water caused a suspension of navigation between St. Louis, Mo., and Cairo, Ill., until the 14th, when it was resumed after an interruption of 23 days.

The Mississippi was frozen over during the entire month to below Leclaire, Iowa, and floating ice was observed as far south as Cairo, Ill., on the 2d and 3d. At Hannibal, Mo., the ice

gorged at the Wabash Bridge on the 1st, and did not break away until the 15th.

The Missouri River remained frozen to within a few miles of Omaha, Nebr., but nothing of interest was noted.

No ice was reported in the Ohio River below Portsmouth, Ohio.

Heavy rains over the south Atlantic and Gulf watersheds on the 10th and 11th caused marked rises in the rivers of those districts, and stages near or above the danger lines were quite general in South Carolina, Georgia, and Alabama, particularly in the latter state. Warnings were issued whenever necessary, and they proved to be both accurate and timely. The following report on the flood of the Coosa and Alabama rivers was made by Mr. F. P. Chaffee, official in charge of the Weather Bureau office at Montgomery, Ala.:

Heavy rains fell over the Coosa watershed during the night of 10–11th, ranging from 1.78 inch at Resaca, Ga., to 6.25 inches at Lock No. 4 (Lincoln), Ala., south of which place the rainfall averaged about three-fourths of an inch. Anticipating rapid river rises, warnings were issued on the morning of the 11th, stating that the Coosa would rise rapidly during the next two days, reaching danger line at Gadsden and Lincoln, Ala., by the night of the 12th, with a decided rise at Wetumpka, Ala., and that the Alabama would also rise rapidly during the next three days. The rains continued over the entire watershed of the Coosa and Alabama during the 11th, the total 48-hour rainfalls varying from about one and one-quarter to seven and one-quarter inches.

On the 12th, freshet warnings were issued to Rome, Ga., and Gadsden and Lock No. 4, Ala., were notified that slightly higher floods would prevail at those points, and warnings were also issued from Montgomery to Selma, Ala., that stock and other property liable to damage should be moved from lands subject to overflow at 35 feet, as stages of over 36 and 39 feet would be reached at Montgomery and Selma, Ala., respectively. Later the expected stage for Montgomery was raised to 38 feet.

Both the Coosa and Alabama rivers rose very rapidly during the 11th, 12th, and 13th, the rise during the twenty-four hours ending at 8 a. m. of the 12th being 23.1 feet at Wetumpka, and 16.7 feet at Montgomery, Ala.

The following maximum stages were reported on this rise:

	Maximum stage.	Danger line.
	Feet.	*Feet.*
Resaca	25.7	25
Rome	27.0	30
Gadsden	22.4	18
Lock No. 4	17.6	17
Wetumpka	39.2	45
Montgomery	37.7	35
Selma	40.0	35

The Coosa was falling at all stations by the morning of the 15th, and the flood crest passed Selma during the afternoon of 17th.

The warnings, which were well in advance of the flood crest, were well distributed by telegraph, telephone, mail, and the local press.

The warnings were highly commended by the local press and were of great value to the lumber and stock raising interests of this section. It is ascertained from a reliable source, that near Coosada, Ala., a small town about 16 miles north of here, 400 head of cattle which would otherwise very probably have been drowned, were driven to high ground and saved as a result of the warnings.

It is conservatively estimated that $200,000 is the value of the property jeopardized by this rapid river rise; thus far, this office has received no information of serious loss.

The flood in the Warrior and lower Tombigbee rivers was also very pronounced, the waters reaching from 13 to 15 feet above the danger lines at Demopolis and Tuscaloosa, Ala.; warnings of this flood were issued twenty-four or more hours in advance.

Heavy snows fell during the early days of the month over the higher districts of southern Oregon. These snows were followed by warm and heavy rains from the 10th to the 15th, inclusive, and the inevitable result was a decided freshet in the Willamette River and its tributaries. A report on this flood by Mr. E. A. Beals, Forecast Official in charge of the Portland, Oreg., forecast district, follows:

During the first ten days of January the weather in western Oregon was slightly cooler than usual and considerable snow fell in the foothills and mountains. On January 7, 96 inches of snow was reported on the ground at Siskiyou, Oreg., which is one of the highest stations on the Southern Pacific railroad between Portland, Oreg., and San Francisco, Cal. The snowfall in other portions of southern Oregon was correspondingly heavy, and it is estimated to have been the heaviest occurring there within the last ten years.

It was natural to expect with this snowfall that upon a return to warmer weather the streams of western Oregon would rapidly rise, and, if the warm weather was attended by rain, that freshets would occur.

During the afternoon of January 10 rain began falling generally throughout western Oregon, and by the next morning a marked change to warmer weather had occurred.

The morning weather map of January 11, 1901, contained the following announcement: "The rains with mild temperatures will continue in this district for 24 hours longer, and there is danger of a small freshet occurring in the Willamette River, ample notification of which will be given by special bulletins should it prove likely to cause damage."

The rains with mild temperatures continued until the 15th, when they ceased. The quantities measured from January 10 to 15, inclusive, are graphically presented on the inclosed chart; they amount to between 4 and 5 inches, and their distribution is quite uniform throughout the entire Willamette drainage area.

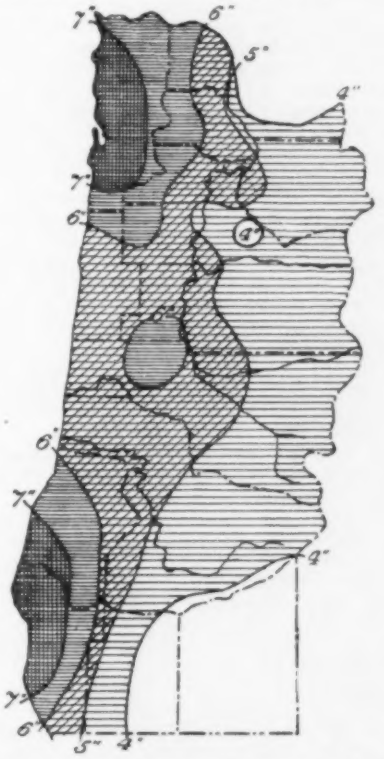

FIG. 1.—Rainfall in western Oregon, January 10–15, inclusive, 1901.

The flood crest was 77 hours in reaching Portland from Eugene, Oreg., which is a distance by water of 140 miles; it was 43 hours in reaching Portland from Albany, Oreg., a distance by water of 89 miles, and 32 hours from Salem to Portland, Oreg., which is a distance of 59 miles.

The river gage at Salem was washed away during the afternoon of January 15, and the height of the flood crest and exact time of its occurrence at Salem are unknown, but are believed to be 31.5 feet at about 9 p. m. January 15, 1901.

Following the first announcement of a possible flood in the morning weather map of January 11, 1901, river forecasts were issued daily thereafter until the danger had passed; the last river forecast was issued at 8 p. m., January 19, 1901. and read as follows: "The river at Portland reached a stage of 15 feet at 5:45 p. m., local time, Saturday, and it will continue to fall for the next few days."

On January 14 it was estimated that the maximum height of the river at Portland would be about 18 feet and be reached the next afternoon. The estimate was increased the next morning to 19 feet, and then later to about 20 feet. The maximum height reached was 20.9 feet at 5 a. m., local time, January 17, 1901.

Owing to the timely warnings very little damage occurred at Portland, Oreg., but a number of bridges were washed away and some logs were lost at places up the river. Many landslides were reported, with much resulting damage to railroads and some minor injuries to a few persons.

The highest and lowest water, mean stage, and monthly range at 127 river stations are given in table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Precipitation is expressed in inches and temperature in degrees Fahrenheit.

Alabama.—The mean temperature was 46.0°, or 1.4° above normal; the highest was 75°, at Healing Springs on the 11th, at Eufaula on the 12th, and at Bermuda on the 23d, and the lowest, 19°, at Valleyhead on the 18th and at Decatur on the 31st. The average precipitation was 5.32, or 0.49 above normal; the greatest monthly amount, 11.72, occurred at Lock No. 4, and the least, 2.26, at Livingston.—*F. P. Chaffee.*

Arizona.—The mean temperature was 47.5°, or 3.1° above normal; the highest was 82°, at Sentinel on the 22d and 25th, and the lowest, 6° below zero, at Fort Defiance on the 2d. The average precipitation was 1.29, or 0.53 above normal; the greatest monthly amount, 4.01, occurred at Pinal Ranch, and the least, 0.02, at Walnut Grove.—*W. G. Burns.*

Arkansas.—The mean temperature was 45.6°, or 6.5° above normal; the highest was 78°, at Bee Branch on the 14th and at Rison on the 15th, and the lowest, 7°, at Winslow on the 1st. The average precipitation was 2.21, or 2.20 below normal; the greatest monthly amount, 4.89, occurred at Elon, and the least, 0.76, at Pond.

The mild, open winter has been favorable to wheat, which has made good progress and looks well. The late sown is doing nicely and looks as good as the early sown. Some little damage is being done in a few localities by the hessian fly.—*E. B. Richards.*

California.—The mean temperature was 43.9°, or about normal; the highest was 85°, at Anaheim on the 19th, and the lowest, 26° below zero, at Bodie on the 1st and at Boca on the 10th. The average precipitation was 5.21, or 0.74 above normal; the greatest monthly amount, 24.46, occurred at Summerdale, while none fell at Needles.—*A. G. McAdie.*

Colorado.—The mean temperature was 26.7°, or 2.8° above normal; the highest was 83°, at Blaine on the 13th, and the lowest, 45° below zero, at Antelope Springs on the 14th. The average precipitation was 0.55, or 0.22 below normal; the greatest monthly amount, 4.12, occurred at Ruby, while none fell at Crook and Holyoke.—*F. H. Brandenburg.*

Florida.—The mean temperature was 57.3°, or slightly below normal; the highest was 91°, at Hypoluxo on the 2d, and the lowest, 22°, at Sumner on the 18th and at Middleburg on the 19th. The average precipitation was 2.45, or 0.27 below normal; the greatest monthly amount, 9.62, occurred at Hypoluxo, and the least, 0.25, at Marco.—*A. J. Mitchell.*

Georgia.—The mean temperature was 46.3°, or 0.8° above normal; the highest was 81°, at Quitman on the 11th, and the lowest, 13°, at Dahlonega on the 18th. The average precipitation was 4.80, or 0.30 above normal; the greatest monthly amount, 8.02, occurred at Gainesville, and the least, 2.52, at Brent.

The weather was very favorable to agricultural pursuits and interests. Wheat, oats, and rye are generally reported to be in excellent condition. Moisture has been ample to all needs, and much preparatory work on land has been accomplished.—*J. B. Marbury.*

Idaho.—The mean temperature was 26.4°, or 1.1° above normal; the highest was 75°, at Idado City on the 3d, and the lowest, 23° below zero, at Lost River on the 1st. The average precipitation was 1.82, or 0.13 below normal; the greatest monthly amount, 4.65, occurred at Murray, and the least, 0.30, at Blackfoot.

During the first twelve days considerable snow fell in the wheat growing districts. Over the high plateaus the snow fell to sufficient depths to afford protection to the cereal crops, but in the low valleys it quickly disappeared, exposing the wheat to the freezing and thawing processes. The grass on the ranges has afforded good grazing, and the necessity has not yet arisen to feed much hay to the stock.—*S. M. Blandford.*

Illinois.—The mean temperature was 30.2°, or 3.5° above normal; the highest was 69°, at St. John on the 16th, and the lowest, 15° below zero, at Kishwaukee on the 1st. The average precipitation was 1.45, or 0.91 below normal; the greatest monthly amount, 2.50, occurred at Rushville, and the least, 0.57, at Martinsville.

The average condition of wheat is favorable, and some improvement over last month is apparent. There has been but little snow protection, especially in the central and southern districts, but, notwithstanding this fact, there has been very little damage by freezing and thawing. Rye is generally in good condition and meadows are looking well.—*M. E. Blystone.*

Indiana.—The mean temperature was 30.4°, or 1.8° above normal; the highest was 68°, at Boonville on the 8th, and the lowest, 15° below zero, at Cambridge and Richmond on the 31st. The average precipitation was 1.44, or 1.46 below normal; the greatest monthly amount, 3.19, occurred at Angola, and the least, 0.45, at Boonville.

At the end of the month wheat is in fair condition; the fly has injured the early sown fields.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 23.7°, or 6.5° above normal; the highest was 60°, at Keokuk on the 15th, and the lowest, 21° below zero, at Elkader on the 1st. The average precipitation was 0.74, or 0.43 below normal; the greatest monthly amount, 2.34, occurred at Olin, and the least, 0.04, at Murray.—*J. R. Sage, Director; G. M. Chappel, Assistant.*

Kansas.—The mean temperature was 32.5°, or 3.5° above normal; the highest was 80°, at Ulysses on the 16th, and the lowest, 21° below zero, at Achilles on the 1st. The average precipitation was 0.41, or 0.45 below normal; the greatest monthly amount, 1.70, occurred at Oswego, and the least, 0.02, at Newton.

Wheat continued in good condition in the eastern, middle, and southern counties; the cold weather the last of December and the first days of January checked its rapid growth, and the dry weather prevented a renewal; it has afforded good pastures in many counties. The fly has injured it in a few of the central counties. In the northwestern and western counties much of the early sown has died, while the later sown remains in the ground dormant. Much spring plowing has been accomplished in the south.—*T. B. Jennings.*

Kentucky.—The mean temperature was 36.7°, or 1.3° above normal; the highest was 75°, at Franklin on the 8th and 9th, and at Manchester on the 9th, and the lowest, 4°, at Scott on the 31st. The average precipitation was 1.85, or 2.31 below normal; the greatest monthly amount, 4.06, occurred at Franklin, and the least, 0.47, at Frankfort.

It is thought that wheat was injured to some extent by freezing, owing to almost entire absence of snow protection, but as there were no severe or extended cold spells it is probable that the damage from freezing is not general nor very great. The crop is in bad condition in some localities from attacks of the hessian fly. Mild and comparatively dry weather permitted considerable plowing for corn.—*H. B. Hersey.*

Louisiana.—The mean temperature was 53.0°, or 2.3° above normal; the highest was 80°, at Donaldsonville on the 9th, and the lowest, 20°, at Plain Dealing on the 19th. The average precipitation was 3.75, or 1.28 below normal; the greatest monthly amount, 6.51, occurred at Como, and the least, 0.72, at Minden.—*W. T. Blythe.*

Maryland and Delaware.—The mean temperature was 32.6°, or 0.7° above normal; the highest was 68°, at Charlotte Hall, Md., on the 9th, at Takoma Park, Md., on the 15th, and at Milford, Del., on the 17th; the lowest, 4° below zero, at Deerpark, Md., on the 20th. The average precipitation was 2.72, or 0.13 below normal; the greatest monthly amount, 6.22, occurred at Deerpark, Md., and the least, 1.14, at Cumberland, Md.—*Oliver L. Fassig.*

Michigan.—The mean temperature was 21.4°, or about normal; the highest was 55°, at Traverse City on the 20th, and the lowest, 28° below zero, at Humboldt on the 3d. The average precipitation was 1.77, or 0.52 below normal; the greatest monthly amount, 5.40, occurred at Berrien Springs, and the least, 0.65, at Port Austin.—*C. F. Schneider.*

Minnesota.—The mean temperature was 13.2°, or 2.8° above normal; the highest was 49°, at Blooming Prairie on the 14th, and the lowest, 47° below zero, at Pokegama on the 2d. The average precipitation was 0.38, or 0.38 below normal; the greatest monthly amount, 1.00, occurred at Red Wing, and the least, trace, at Leech Lake Dam.

The snow in the timber regions seems to have been more abundant. With moderately cold weather which favored the making of ice roads in the woods the lumbermen have been able to haul their logs satisfactorily.—*T. S. Outram.*

Mississippi.—The mean temperature was 48.8°, or 2.0° above normal; the highest was 76°, at Biloxi on the 29th, and the lowest, 18°, at Ripley on the 31st. The average precipitation was 5.23, or about normal; the

greatest monthly amount, 9.05, occurred at Thornton, and the least, 2.49, at Biloxi.—*W. S. Belden.*

Missouri.—The mean temperature was 34.9°, or 5.1° above normal; the highest was 72°, at several stations on the 15th, and the lowest, 11° below zero, at Bethany on the 1st. The average precipitation was 1.30, or 0.84 below normal; the greatest monthly amount, 3.57, occurred at Fulton, and the least, 0.22, at Gallatin.

For the State, as a whole, it was the warmest January during the past fourteen years. In the southern portion of the State much plowing was done for spring crops. Although wheat received little or no protection from snow, the ground being comparatively dry very little damage resulted from alternate freezing and thawing, and at the close of the month the crop was reported in excellent condition, except in those counties in the eastern and southern sections, where the early sown has been seriously injured by fly. Pastures continue to afford considerable grazing and stock required much less feed than usual.—*A. E. Hackett.*

Nebraska.—The mean temperature was 26.7°, or 6.2° above normal; the highest was 72°, at Palmer on the 21st, and the lowest, 27 below zero, at Madrid on the 2d. The average precipitation was 0.17, or 0.44 below normal: the greatest monthly amount, 1.30, occurred at Beatrice, while none fell at several western stations.

Snow remained on the ground but a short time, and the ground was uncovered most of the month. The temperature was so high, however, that no damage resulted to fall sown grain. The month was most favorable for all agricultural interests.—*G. A. Loveland.*

Nevada.—The mean temperature was 30.1°, or 4.3° above normal; the highest was 75°, at Lovelock on the 24th, and the lowest, 19° below zero, at Hamilton on the 2d. The average precipitation was 1.51, or 0.44 below normal; the greatest monthly amount, 6.33, occurred at Lewers Ranch, and the least, trace, at Hot Springs.—*J. H. Smith.*

New England.—The mean temperature was 21.8°, or about normal; the highest was 55°, at New Bedford, Mass., on the 10th, and the lowest, 31° below zero, at St. Johnsbury, Vt., on the 20th. The average precipitation was 2.24, or 1.64 below normal; the greatest monthly amount, 6.67, occurred at Carmel, Me., and the least, 1.21, at Bristol, R. I.

The temperature conditions of the month were exceptionally favorable to the ice interests, and large crops have been harvested in excellent condition.—*J. W. Smith.*

New Jersey.—The mean temperature was 30.4°, or slightly above normal; the highest was 63°, at Beverly and Friesburg on the 16th, and the lowest, 6° below zero, at Layton on the 20th. The average precipitation was 2.52, or 1.14 below normal; the greatest monthly amount, 4.00, occurred at Ocean City, and the least, 1.35, at Layton.—*E. W. McGann.*

New Mexico.—The mean temperature was 35.5°, or 2.4° above normal; the highest was 78°, at Gallinas Springs on the 23d, and the lowest, 20° below zero, at Bluewater on the 2d. The average precipitation was 0.51, or about normal; the greatest monthly amount, 2.00, occurred at Winsors, and the least, trace, at Bluewater and Socorro.—*R. M. Hardinge.*

New York.—The mean temperature was 23.0°, or slightly above normal; the highest was 54°, at Lockport on the 25th, and the lowest, 37° below zero, at Axton on the 20th. The average precipitation was 2.10, or 0.79 below normal; the greatest monthly amount, 4.15, occurred at South Berlin, and the least, 0.76, at Binghamton.

Snow protection obtained in the northern portion during the entire month, being very heavy in and around the mountain sections and in a large part of the central sections. Very little snow fell during the month in the southern counties of the interior and in the southeast section, including the Hudson Valley south of Albany, until the last two days, when moderate snows were general in nearly all sections. Some damage to wheat and rye in unprotected sections is reported, but the month on the whole was favorable, and the condition of these crops was about the average on January 31.—*R. G. Allen.*

North Carolina.—The mean temperature was 40.8°, or slightly above normal: the highest was 81°, at Washington on the 11th, and the lowest, 6°, at Highlands on the 18th. The average precipitation was 2.93, or 1.40 below normal; the greatest monthly amount, 7.50, occurred at Murphy, and the least, 1.76, at Pittsboro.

The weather was generally favorable for wheat. Some reports were received of damage by freezing and high winds, but plants generally were too well rooted to suffer much. Wheat spread nicely and looked vigorous and promising at the close of the month.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 7.7°, or about 1.0° above normal; the highest was 68°, at Fort Yates on the 23d, and the lowest, 39° below zero, at Pembina on the 2d. The average precipitation was 0.28, or 0.15 below normal; the greatest monthly amount, 1.64, occurred at Dunseith, and the least, trace, at Falconer and Steele.

Some suffering was experienced by stock grazing on the prairies during storms, but no serious loss is reported. On the whole the month was very favorable for stock raisers.—*B. H. Bronson.*

Ohio.—The mean temperature was 29.2°, or 1.4° above normal; the highest was 67°, at Hanging Rock on the 9th, and the lowest, 10° below zero, at Wauseon on the 3d. The average precipitation was 1.70, or 1.24 below normal; the greatest monthly amount, 3.30, occurred at Montpelier, and the least, 0.67, at Philo.

Wheat has been injured some in the southern part of the State by freezing and thawing, but in the middle and north no material injury has resulted and many correspondents in these sections report the plants in excellent condition. Other winter grains are reported in good condition. Fruit trees have received no injury during the winter.—*J. Warren Smith.*

Oklahoma and Indian Territories.—The mean temperature was 40.8°, or 2.7° above normal; the highest was 79°, at Hartshorne on the 15th, and the lowest, 11° below zero, at Kenton on the 1st. The average precipitation was 0.52, or 0.84 below normal; the greatest monthly amount, 1.90, occurred at Bengal, while none fell at Roff.

The weather conditions during the month were but a continuation of those existing during December, that is, characterized by warm weather and deficient rainfall. Wheat was in very good condition, growing rapidly, and being extensively pastured. Stock was doing well and feed was plentiful. Plowing for spring crops was under rapid headway, except where ground was too dry to work.—*C. M. Strong.*

Oregon.—The mean temperature was 36.7°, or nearly normal; the highest was 76°, at Prineville on the 1st, and the lowest, 8° below zero, at Burns on the 8th and at Beulah on the 9th. The average precipitation was 7.63, or 1.47 above normal; the greatest monthly amount, 19.39, occurred at Hare, and the least, 0.08, at Silverlake.

The month as a whole was unfavorable for farm work, owing to unusually heavy precipitation during the first half of the month, which rendered the soil too wet for plowing. The closing days were more favorable, being moderately warm for the season, with an abundance of bright sunshine and drying easterly winds. Winter wheat made satisfactory advancement, and at the close of the month was everywhere reported in excellent condition. The hessian fly has entirely disappeared since the heavy rains. Pastures were greatly benefited by the wet weather, and there is an abundance of feed for stock.—*A. B. Wollaber.*

Pennsylvania.—The mean temperature was 29.1°, or 1.4° above normal; the highest was 59°, at Pittsburg on the 10th, at Philadelphia on the 16th, and at Lancaster on the 17th, and the lowest, 10° below zero, at Saegerstown on the 6th and at Lawrenceville on the 31st. The average precipitation was 2.22, or 1.04 below normal; the greatest monthly amount, 4.41, occurred at Somerset, and the least, 0.74, at Athens.

Owing to the light snowfall and the successive freezing and thawing weather during the first three weeks in the month, wheat and rye were both damaged somewhat by the roots being heaved out of the ground, but the average condition of these crops at the close of the month was considered better than at the close of January, 1900.—*L. M. Dey.*

South Carolina.—The mean temperature was 45.1°, or slightly above normal; the highest was 81°, at Trial on the 10th, and the lowest, 18°, at Liberty on the 26th. The average precipitation was 3.55, or slightly below normal; the greatest monthly amount, 5.60, occurred at Liberty, and the least, 1.20, at Pinopolis.

The ground was generally too wet to plow and little or no spring oats were sown. Wheat and oats were in good condition at the close of the month.—*J. W. Bauer.*

South Dakota.—The mean temperature was 21.0°, or about 6.0° above normal; the highest was 63°, at Academy on the 19th, and the lowest, 23° below zero, at Leola on the 2d. The average precipitation was 0.12, or 0.43 below normal; the greatest monthly amount, 0.47, occurred at Fort Meade, while none fell at Oelrichs.—*S. W. Glenn.*

Tennessee.—The mean temperature was 40.1°, or 1.7° above normal; the highest was 70°, at Johnsonville on the 8th and at Grace and McMinnville on the 9th, and the lowest, 11°, at Iron City on the 18th and at Hohenwald on the 31st. The average precipitation was 3.94, or 0.90 below normal; the greatest monthly amount, 6.58, occurred at Tellico Plains, and the least, 1.88, at Elk Valley.

The weather was generally favorable for wheat, but growth was slow, the absence of snow and the alternate freezing and thawing keeping it backward.—*H. C. Bate.*

Texas.—The mean temperature was 52.4°, or 3.8° above normal; the highest was 87°, at Camp Eagle Pass on the 29th, and the lowest, 3°, at Tulia on the 2d. The average precipitation was 0.60, or 1.70 below normal; the greatest monthly amount, 3.30, occurred at Longview, while none fell at several stations.

The month as a whole was unfavorable for agricultural interests, except in a few instances. The rainfall over the central and northern portions of the State was especially light and was insufficient for growing crops, and also for keeping the soil in condition for tillage. Wheat suffered for rain in many localities, and while growing nicely in a few places, all reports at the close of the month indicated that the crop needed rain badly. Preparations for spring crops are being pushed as rapidly as possible. Dry weather is interfering with plowing in many localities, and a general rain is needed at the close of the month.—*I. M. Cline.*

Utah.—The mean temperature was 28.2°, or 2.7° above normal; the highest was 64°, at St. George on the 6th, and the lowest, 26° below zero, at Henefer on the 1st. The average precipitation was 0.68, or 0.30 below normal; the greatest monthly amount, 2.24, occurred at Park City, while none fell at Smithville.—*L. H. Murdoch.*

Virginia.—The mean temperature was 35.5°, or 1.9° above normal;

the highest was 77°, at Bonair on the 9th, and the lowest, zero, at Hot Springs on the 31st. The average precipitation was 2.61, or 0.53 below normal; the greatest monthly amount, 4.33, occurred at Bigstone Gap, and the least, 1.62, at Stanardsville.

Winter crops made quite favorable progress throughout the month. Thus far no evidences of winter killing have developed. There is very little complaint of damage from hessian fly. The early seeding is generally in fine condition of growth and vigor, while the late seeding is somewhat backward. Considerable spring plowing was done during the latter part of the month in portions of the valley sections.—*E. A. Evans.*

Washington.—The mean temperature was 33.1°, or slightly above normal; the highest was 59°, at Walla Walla on the 12th, and the lowest, 17° below zero, at Republic on the 9th. The average precipitation was 4 56, or 0.37 below normal; the greatest monthly amount, 13.78, occurred at Neah Bay, and the least, 0.84, at Pasco.

Considerable snow fell during the forepart of the month, which melted during the latter part.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 33.6°, or 1.2° above normal; the highest was 69°, at Green Sulphur Springs on the 9th, and the lowest, 4° below zero, at Dayton on the 20th. The average precipitation was 2.41, or 0.52 below normal; the greatest monthly amount, 3.87, occurred at Beverly, and the least, 1.18, at Parkersburg.

The weather has been dry and rather mild during the month, but the almost daily freezing and thawing, with practically no snow protection, has been unfavorable for wheat, rye, and grass.—*E. C. Vose*

Wisconsin.—The mean temperature was 17.8°, or 3.1° above normal; the highest was 59°, at Port Washington on the 19th, and the lowest, 31° below zero, at Grantsburg and Hayward on the 2d. The average precipitation was 0.77, or 0.69 below normal; the greatest monthly amount, 1.70, occurred at Port Washington, and the least, 0.10, at Bayfield.—*W. M. Wilson.*

Wyoming.—The mean temperature was 24.7°, or 2.4° above normal; the highest was 65°, at Cody on the 18th, and the lowest, 44° below zero, at Daniel on the 1st. The average precipitation was 0.26, or 0.39 below normal; the greatest monthly amount, 2.28, occurred at Fort Yellowstone, while none fell at several stations.—*W. S. Palmer.*

Cuba.—The mean temperature was 70.5°; the highest was 91°, at San Cayetano on the 2d, Los Canos (Guantanamo) on the 3d and 16th, and Soledad (Guantanamo) on the 2d and 4th, and the lowest, 38°, at Rosario (Aguacate) on the 27th. The average precipitation was 1.52; the greatest monthly amount, 8.44, occurred at Havana, and the least, 0.22, at Puerto Principe.

The weather was ideal for harvesting and grinding the cane crop, but lack of rain and the prevalence of brisk winds proved injurious to the tobacco.—*M. W. Hayes.*

Porto Rico.—The mean temperature was 74.1°, or 0.7° above normal; the highest was 96°, at Cayey on the 19th, and the lowest, 50°, at Comerio on the 12th. The average precipitation was 5.09, or 0.46 below normal; the greatest monthly amount, 14.20, occurred at Coamo, and the least, 2.19, at Mayagüez.

Sugar making is general and the weather very favorable. Cane is maturing nicely; yield of the crop is an average, but not as good as anticipated. The new crop of cane is doing well and some still being planted. The new crop of tobacco is doing well; the old crop is being cut; yield is below an average, but the quality is good. Coffee trees are blooming well and a good crop is promised. Small crops, such as beans, lettuce, corn, cucumbers, cabbage, carrots, sweet potatoes, squashes, lernes, okra, and cazava, are being gathered. Some new crops are being planted. Rain is needed over the extreme western districts, where the drought continues.—*Joseph L. Cline.*

SPECIAL CONTRIBUTIONS.

THE RELATION OF RAINFALL TO MOUNTAINS.

By W. H. ALEXANDER, Observer Weather Bureau, dated January 18, 1901.

The object of the present communication is to enable the reader to arrive at a clear understanding as to how and to what extent hills and mountains influence the rainfall of a country. To this end attention is invited to a brief summary of well established facts and principles relative to temperature, evaporation, and condensation.

The water contained in any vessel, although it appears to be one mass, is in reality made up of a vast number of minute masses called molecules of water, separate and distinct from each other. Although no one has ever seen these molecules, yet no student of science can doubt their existence any more than he doubts the existence of individual grains of sand in a block of sandstone. It is confidently believed that if a person were endowed with supernatural sight, he could see these countless molecules. Most likely he would be greatly astonished at the large distances separating them and at the rapid and ceaseless motion of these minute bodies among themselves. This inter-molecular motion gives us the phenomenon of heat and the violence of the motion determines the temperature of the body; if they move slowly, the temperature is low; if rapidly, the temperature is high. The amount of heat within a body must depend, not only on the rate of molecular motion, but on the number of the molecules and their size or mass; the amount of heat in a body is the sum total of all the molecular energy within the body. The temperature does not mean the amount of heat, because the body may have a high temperature and very little heat, or a low temperature and a large amount of heat. That heat which a body contains that does not raise its temperature is called latent heat. The amount of heat that it is necessary to give a body in order to raise the temperature of a unit mass by one degree is called the specific heat.

Suppose that in some way the temperature is lowered and molecular motion overcome until finally the molecules cease their struggle and come to rest; the body is now without heat, its temperature is said to be that of absolute zero and the body has contracted in volume to its smallest possible size. Gases, like the air, contract so regularly that by measuring their volumes at temperatures successively lower and lower, it has been calculated that they would have no volume, or one inappreciably minute, at a temperature of about —460° on the Fahrenheit scale, or —273° on the centigrade scale, which, therefore, corresponds with the absolute zero of temperature. If we should put the zero of our thermometer at this point on the scale and count from that point upward, we should have what are called absolute temperatures; thus, the temperature of freezing water is 273° C.; on the absolute scale, or 460° F. A glass of water that has a temperature of 70° on the ordinary Fahrenheit scale, would have one of 530° on the absolute Fahrenheit scale.

Again, as heat is the energy of the rapidly moving molecules, the superhuman observer would see them striking against the sides of the vessel containing the liquid and pounding each other incessantly, thereby producing a pressure against the sides of the vessel; but at the upper surface, the so-called free surface of the liquid, there would seem to be a battle between the molecules of water below and those of the air above. The gaseous molecules are pounding down upon the water, the aqueous molecules are striking upward from below. There is a boundary surface between the two at which a majority of the molecules seem to rebound back into their own element, but occasionally a molecule of water shoots far into the region of air and more rarely one of air shoots into the water. These become, as it were, lawless wanderers in the enemy's country; they are captives that will probably never return to the mass from which they are separated. This breaking away of the molecules of water escaping into the space above is called evaporation. This free molecule is now called water vapor, although no change has occurred in its real nature. The rate at which evaporation takes place depends upon the extent of the evaporating surface as well as on the pressure exerted by the exterior gas upon that surface and on the temperature, not only of the evaporating liquid, but of the gas into which the evaporation takes place. The rela-

tion between extent of surface and evaporation is evidently one of direct proportionality. So essential is an abundant evaporation to life upon this earth that three-fourths of the surface of the globe must be devoted to it; but, of course, the evaporation from the salt water ocean is much less vigorous than from surfaces of fresh water.

A hot body evaporates more rapidly than a cold one, because in the hot body the velocities of the molecules are larger and their power to break away and free themselves is greatly augmented without any increase whatever in the restraining power. Moreover, if the atmosphere is also hot, then, its molecules also have greater velocities and are, on the average farther apart, so that there is greater room and opportunity for the passage of the molecules of vapor between them. However, the influence of the atmosphere upon evaporation is purely mechanical, and, in fact, preventive; it simply retards the diffusion. The law on this point is that the rate of evaporation increases nearly in proportion as the barometric pressure diminishes. Air currents are very essential, since they bring about a rapid and thorough distribution of aqueous vapor, which, without such air, would require a very long time to work its way to distant places. If there were no air whatever around a drop of water it would evaporate most freely and rapidly and the space within a given distance, say a radius of one foot, would become saturated with vapor much quicker than if air were present, although strange to say, the actual quantity of vapor evaporated into this saturated space would be, as far as we can measure, precisely the same as if the air were present.

In studying mixtures of gases and vapors, it is important to bear in mind that each gas composing the mixture endeavors to adjust itself to what is called a condition of equilibrium, just as if it were all alone in that space. Hence, it follows that in a mixture of gases the lighter gas does not rise to the top and the dense one sink to the bottom, as a permanent condition of stability, but, although they may temporarily do this, yet, after a sufficient time, we shall find that they have mutually interpenetrated each other and are diffused uniformly throughout the whole space. In fact, one may make a striking experiment, to quote from Watson's Text-book of Physics, London, 1899, pages 166–177:

> If two equal bottles, one containing hydrogen and the other carbonic acid gas, are placed mouth to mouth, the bottle containing the hydrogen being on the top, then, after a certain time, it will be found that half of the hydrogen has traveled down into the lower bottle and half of the carbonic acid gas has ascended into the upper bottle, and this in spite of the fact that the density of the carbonic acid gas is 22 times as great as that of the hydrogen.

To illustrate further, suppose that in a cubic foot of air the barometer stands at 30 inches; this pressure is made up of two parts, that which is due to the elastic pressure of the dry air and that which is due to the elastic pressure of the aqueous vapor contained therein. Suppose, now, we raise the temperature of the air and allow moisture to evaporate into the atmosphere and diffuse uniformly until the air, or more properly the space, is saturated, our cubic foot will contain more moisture than before, and if the pressure remain at 30 inches it must therefore contain less air. In a saturated space the amount of moisture depends upon the temperature of the space and not on the barometric pressure, at least for all ordinary cases. It is true we often speak of the air as if it had a capacity for vapor, but in fact it has no power whatever to hold vapor.

Careful experiment has shown that a cubic foot of space, when saturated with moisture, may contain 0.48 grain of aqueous vapor and no more, when the temperature is 0° F. and the barometric pressure within that space will be 0.038 inches unless some other gas is present to increase the pressure. At 100° F., the cubic foot may contain 19.77 grain and the pressure will be 1.916 inches; but if the air is also present to such an extent that its pressure is 28.084 inches, then the total pressure will be 30 inches and the weight of the dry air itself will be 467.77 grains, while the total weight of the vapor and the air in the saturated space will be 485.54 grains. It does not follow that when the air becomes saturated the evaporation ceases; on the contrary, the more proper statement is that at this time the number of molecules that are evaporated from the liquid is exactly equal to the number that return to the liquid, so that the captures on both sides are equal in number.

To show more fully the relations between temperature and moisture in the free atmosphere, attention is invited to the following table [corrected by the Editor to agree with the newest edition of the Weather Bureau psychrometric tables]:

Pressure and weight of vapor and air in a cubic foot of atmosphere at a pressure of 30 inches when saturated at the respective temperatures.

Temperature.	Vapor pressure.	Air pressure.	Vapor weight.	Dry air weight.	Saturated air weight.
° *F.*	*Inches.*	*Inches.*	*Grs. per cu. ft*	*Grs. per cu. ft.*	*Grs. per cu. ft.*
0	0.038	29.962	0.48	605.32	605.80
+10	0.063	29.937	0.78	591.93	592.71
20	0.103	29.897	1.24	578.79	580.03
30	0.164	29.836	1.94	565.79	567.73
40	0.247	29.753	2.85	552.89	555.74
50	0.360	29.640	4.08	539.93	544.01
60	0.517	29.483	5.74	526.75	532.49
70	0.732	29.268	7.98	512.98	520.96
80	1.022	28.978	10.93	498.48	509.41
90	1.408	28.592	14.79	482.85	497.64
+100	1.916	28.084	19.77	467.77	485.54

In this table the second and third columns give us the height of the barometer when, in a saturated atmosphere, the mercurial column is sustained only by the pressure of the aqueous vapor or the dry air, respectively. The third column gives the actual weight in grains of the vapor, and the fourth gives the weight of the air in a cubic foot of space saturated at the given temperatures and total pressure of 30 inches. This is the capacity of space, or, if you will, of air, for aqueous vapor, and it increases very rapidly with rising temperature. The rate of rise is only 0.3 grain between zero and + 10°, but it is 5 grains between 90° and 100° F. The last column shows the combined weight of air and vapor in the cubic foot of space when the air is saturated, and we see at once that at high temperatures saturated air weighs less or is much lighter than at low temperatures. The inverse relation is shown in the fourth column, namely, that the higher the temperature so much the less is the quantity of air as distinguished from vapor.

The above figures relate to what is called absolute humidity of saturated air. But if we compare the actual amount present in air that is not fully saturated with what it would be if saturated, we obtain an idea of the relative condition. We may, for instance, say that saturated air has 100 per cent, or all that it can possibly hold at that temperature. If now it has only half that amount, we say that it's relative humidity is 50 per cent, or, in general, we obtain the relative humidity by dividing the amount actually present by the amount that is possible in the case of saturation.

There is another method of considering the moisture in the air, namely, we may merely state the temperature to which the air must be cooled in order to produce a slight deposition of dew. This temperature we call the *dew-point of the air*. When air is cooled to its dew-point, it thereby becomes saturated.

To illustrate, when the barometer stands at 30 inches and the air has a temperature of 80° F., I draw a cubic foot of air into a glass globe, apply some drying chemicals which absorb absolutely all the moisture and find that the chemical has increased in weight by 7.99 grains. This represents the weight of the aqueous vapor, or the absolute humidity of the original air. However, from the above table it is seen that it is

possible for a cubic foot of air at 80° F. to contain 10.93 grains; hence, by dividing the actual amount, 7.99, by the possible amount 10.93, I obtain for the relative humidity 73 per cent. On the other hand, suppose that without changing the actual amount of vapor in the air I cool down some of the original moist air from 80° F. to 70° F. The above table shows that at 70° F. our 7.99 grains would be sufficient to saturate a cubic foot of air. Hence the air has now reached the dew-point, and the moment the temperature falls below this point condensation of the vapor will begin and will continue so long as the temperature continues to fall. When the temperature has reached 60° F. 2.24 grains of vapor will have been condensed from each original foot of air.

This condensed vapor will appear either in the form of fog, snow, rain, or dew, depending upon other conditions. Condensation is essentially the rushing together of the surplus molecules of aqueous vapor, forming small drops of water or crystals of ice, which become visible as fog or cloud. The tendency of these minute drops is to fall to the ground, but the upward air currents are generally quite sufficient to sustain them until the drops grow to a larger size, when they are precipitated as rain. When the condensation is very rapid the upward currents are also rapid and the raindrops are likely to be large. Of course, snow is formed only when the temperature of condensation, namely, the dew-point, is below freezing.

Precipitation, therefore, depends upon a falling temperature, and the primary question is how may this be brought about. The most common and effective ways and in the order of increasing importance are: (1) cooling by contact with cooler bodies; (2) mixture with air of lower temperature; (3) loss of heat by radiation; (4) loss of temperature by the utilization of heat in work.

1. The direct contact of warm, moist air with a cold surface, it does not matter whether it be a glass containing cold water or a mountain covered with snow, must result in giving up heat to the cold object, which thereby becomes warmer. Now, the quantity of heat that can be taken up by a cold mountain side is very slight. A little dew may be formed on the rocks, but this represents the extent of its power to condense moisture out of the air.

2. When equal parts of cold and warm air are mixed together, both being saturated, a very slight cloud or haze is formed, due to the fact that the saturated warm air contains a little more moisture than was necessary to saturate the mixture, but this slight haze is the extent of the precipitation that can be formed in this way.

3. When the air is nearly saturated in the daytime, it is apt to cool below its dew-point during the following nighttime; there is thus formed a thin layer of fog near the surface of the earth, or of stratus cloud a few yards above the surface, or perhaps alto-stratus a few thousand feet above that. In either case, the lower side of the fog or cloud receives heat from the earth, while it is only the upper side that cools by radiation into space. During long nights this cooling may produce a deep layer of fog, or a thick layer of cloud, and from the upper surface of these there may fall a light, drizzling rain; but this is the maximum extent of the influence of radiation.

4. The conversion of the molecular energy that we call heat into the movement of large masses that we call work is the most important method of cooling. Whenever a given volume of air flows into a region where the barometric pressure is less, it expands and in this expansion must push aside the air immediately surrounding it. This is the work that is done, and it is exactly equivalent to the amount of heat energy that is consumed. Thus, the steam in a boiler flows into the cylinder and pushes the piston ahead, by doing so it does work and cools off. When the safety valve of the boiler is open, the steam rushes out with great force, expands greatly in volume and cools. In fact, it falls from the temperature within the boiler to the temperature of the open air. When this process takes place quickly and no other heat comes in to disturb the conditions, this is called adiabatic expansion or adiabatic cooling. Whenever a mass of moist air is pushed by the wind over a hill or mountain it expands as it ascends because the pressure diminishes with altitude, and its temperature may easily be reduced below the dew-point, so that by cooling it forms a cloud and by still further cooling may form rain. Ascending air, under the ordinary barometric conditions, must cool at the rate of 1° C. for about 100 meters of ascent, or 1° F. for 183 feet of ascent. Thus, suppose our cubic foot of air at 80° F. to be lifted 1830 feet it would then have cooled to a temperature of 70° F. and be saturated; should it be carried still higher condensation must occur. It is evident that the height to which a body of air must be raised before condensation begins depends upon both the temperature and the humidity of the air at sea level. Hence in regions of high humidity comparatively low mountains may be important agents in bringing about rainfall, whereas in regions of low humidity very high mountains may have little influence. There are mountains which rise to such a height that the air about their summits has a temperature of freezing or less, so that the mountains have a crown of perpetual snow.

The office of mountains is to force the warm moist surface wind into higher regions whereby it is expanded and cooled, and in this way only do they bring about condensation and precipitation. A single peak, even if very high, may not be very effective, as the air currents may pass around it instead of over it, and will merely form clouds in the region of slightly diminished pressure and upward rising currents on the leeward side of the peak. But in the case of a mountain range the whole mass of air driven by the wind must pass over and must, therefore, rise to higher regions in order to do so. The mistake should not be made of supposing that the mountain "acts as a condenser" in the same sense that a blade of grass when chilled by radiation, cools the air in contact with it and accumulates dew. It is evident that if a mountain did act in this way the moisture would be deposited on it in the same manner as dew or frost is deposited on the grass, or on the cool exterior of a glassful of ice water, and the precipitation would not appear as a cloud or as rain. In general, the mountains act merely as obstacles to the currents of air. A mountain may be very effective in the formation of clouds without having much influence on the rainfall. The region or side of the mountain upon which the rain will fall depends almost entirely on the direction from which the moist wind comes. In some cases the wind deflected upward by the mountain may continue rising for a short distance beyond the mountain, so that the rain may fall to the leeward rather than on the mountain itself.

CLIMATE AND CORN.

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The weather exerts a tacit, though relentless, tyranny over the labor and the thought of the agriculturist. The probable influences of the present and prospective weather upon the growing crops are seldom absent from his mind. But science teaches that climate is rhythmic, not capricious. Laplace has shown that the mean temperature of the mass of the earth can not have changed in any appreciable measure during the entire period of astronomical calculation and that while the planetary movements remain as at present no such change can occur. "Astronomical permanency," he says, "implies an absolute fixedness of the quantity of heat for

the mass of the earth." And the sun's heat is the leading element of climate, all other conditions depend in the long run upon that. Hence, the sun's heat being constant, all the changes we observe are periodic as regards the astronomical units, the day and the year; and nonperiodic in all other cases, the averages returning always to a line of absolute permanency.

Climate is the average of seasonal atmospheric conditions, and as corn is an annual plant, these fluctuating seasonal factors must affect its growth. The crop season is in fact the climatic unit with respect to this cereal. No season exactly repeats itself; there are perturbations within relatively narrow limits; the plant strives perpetually to adjust itself to perfect correspondence with its environment. As this environment, that is, climate and food supply, vibrates now one way, now another about a fixed mean, the consequent variations of the plant will be compensatory, and so there should be no final permanent modification of the plant in a given locality. The tendency in the long run is toward a more and more perfect correspondence with environment, toward what Spencer calls the one essential to perfect life.

That the study of climate, as well as soil, in all its bearings upon the great American staple is as profitable as any that engages the attention of the Government is shown by the results already attained, but still more by certain economic considerations. It is a surprising, even startling, fact that the average yield of corn in the United States is only about twenty-three bushels per acre, while a prize yield of more than two hundred bushels is well authenticated. The world is just beginning to appreciate the value of corn as a food, and in the new commercial era that is dawning upon our country it will devolve upon us to supply a large part of the world's demand for this cereal. No valid reason is apparent why the average annual yield should not be twice or thrice what it now is.

Aside from its direct control of the amount and quality of the crop, climatic variations, by vitiating experience, impede agricultural progress. This fact is most apparent in the agricultural history of a new country, where experience acquired in one section is in many cases not only useless, but positively pernicious when applied to a distant section. In the United States millions of dollars have been lost through the efforts of new settlers to learn by experience the climatic peculiarities of their adopted home. It is the province of agricultural science to teach us how to profit by the experience that has been so dearly bought in the past.

Agricultural climatology considers the relations between the meteorological elements measured in terms of plant development. As intimate as these relations are known to be, and as interesting and promising a field as their study is known to offer, it is rather surprising that no adequate organized effort has yet been expended in this direction. But we are coming to see that the very fact of this intimate reciprocal dependence may be turned to advantage, and that by methods of correlation the facts of each science may be made to illumine the other.

The laws of biological and of meteorological phenomena separately considered are extremely subtle and complex, and any attempt to study them in their manifold reciprocal relations is sufficiently difficult to deter any but the best equipped and most zealous students. This difficulty of properly interpreting the separate effects upon vegetation of heat, light, moisture, and the gases of the atmosphere is enhanced by the fact that a change in one meteorological condition ordinarily disturbs all the other elements. For example, rain is accompanied by cloudiness, decrease in light and heat, and, it may be, by an increase of warmth in the soil, if the rain be a warm one.

Extended and elaborate meteorological observations have been conducted in this country and in Europe, but instruments measure only detached elements of climate; plants alone record its composite or cumulative effects. Hence, the insistence on the part of leading agricultural scientists that climate should be studied in terms of plant life. Such study is termed phenology, and while it has led to some valuable generalizations, the fragmentary character of the data vitiates many of its conclusions. It appears that in the past phenologists have given the element of heat undue, if not almost exclusive, weight. It is becoming more and more evident that the real function and value of light have been neglected and undervalued. A fundamental theory which has been held by botanists for more than a century is, briefly, that a certain life event takes place in any species whenever that species has been exposed to a certain sum total of heat, which is called the physiological constant or thermal constant. In harmony with this theory, Blodgett, in his Climatology of the United States, says with regard to corn that its period of growth is precisely proportional to the abruptness of the temperature curve; that its unusual elasticity of constitution admits it to all regions where the temperature reaches a certain point, however brief the duration of this warm period may be. He defines the extreme northern limits of Indian corn as coincident with the isotherm of 67° for July, though a somewhat higher mean for one summer month is required, and he attributes the increase of productiveness at the north mainly to "the hasty growth, the excess of heat while it lasts, and the hastened ripening period." The seemingly insignificant item of a deficiency of two degrees on the mean of a single summer month practically excludes this crop from the British Isles, where it is grown, when grown at all, only as a forage crop, seldom maturing any grain. This statement of the subject has been for fifty years the popular and the current theory. Temperature being the most easily measured of the solar manifestations, it has quite naturally been regarded as the dominant one. Then, too, the rudimentary state of climatology made necessary such a simplification as is afforded by the consideration of heat alone.

The trend of recent opinion is summarized by Professor Abbe in his extensive manuscript report of June, 1891, on the Relations of Climate and Crops, where, after reviewing the investigations of Tisserand, he concludes:

> That the temperature of the air has apparently little to do, in and of itself, with the duration of time from sowing to ripening, but that this depends principally on the sunshine. The temperature of the air controls the chemical composition of the seed, but the effective sunshine seems to be the productive climatic element; it furnishes the total energy at the disposal of the plant, but it is also the one least studied and understood.

Professor Sturtevant, of New York, from tests with 128 varieties, concludes that "actinism has an influence scarcely secondary to temperature."

So it would seem wise in the light of recent study to attribute much of the hostility of a climate like that of England to the greater degree of cloudiness, and the congeniality of the climate of our western States to the habitually clear skies of summer.

In discussing climate and corn it will be convenient to treat their relations first historically and then analytically; a cursory glance at the more evident accumulated results of climatic modification and limitation will prepare the way for an outline of the individual factors that constitute environment and the principles that govern the life of the plant.

The original home of corn, or maize, is now quite certainly known to have been in central Mexico, and hence it is the only one of our cereals that is indigenous to the New World. It has been so long and so thoroughly domesticated that no truly wild varieties are known. In geographical range and elasticity of habit it probably surpasses every other cultivated plant. From its original tropical home it has spread to the

temperate as well as the tropical regions of the world. Introduced into Europe soon after the conquest of Mexico, it finds a genial home only in the warm valleys of the south and central portions of that continent; it is extensively grown in Africa, and in India it thrives everywhere throughout the hill country; it appears to flourish as well in the temperate as the tropical regions, and at altitudes of from sea level to 7,000 feet or more.

Corn is, however, as it has always been and will undoubtedly remain, a distinctive and characteristic American product. It is cultivated from Canada to Patagonia, over 7,000 miles of latitude. It has been known to ripen as far north as 63° and has been found a profitable crop in latitude 51° north. In response to the multifarious conditions which this great range imposes, countless varieties have been developed, there being over 200 in the United States alone. It is interesting to consider some of the extremes of variation as exhibited by the plant and the ear, variations that have their origin ultimately in climate and acclimatization. The matured plant ranges from 2 to 22 feet in height; stalks as tall as 30 feet have been found in the West Indies, and a normal plant 18 inches in height has been known to mature perfect ears. Ears have been known as small as 1½ inches and as great as 16 inches in length. The number of rows of grains to the ear ranges from 6 to 40 or more. The period for growth and maturity varies from six weeks to seven months. Besides the usual colors, white, yellow, and red, the grain is also found to be violet, purple, blue, slate, black, and variegated. Incidentally it may be said that color is by some considered the most stable feature, and red corn is believed to possess a greater fixity of type than any other. Along with these remarkable extremes in size, a corresponding range of total yield is found; though the total crop does not, of course, depend directly upon the size of the ears or of the kernels. Nevertheless there is a very wide disparity in productiveness depending upon climatic irregularities independent of soil fertility or of food supply. Both in quality and productiveness corn has improved to a marked degree in the higher latitudes to which it has spread. Indeed, it is a rather striking fact that the maximum yield is found near the northern limit of its cultivation. The weight of the grain per bushel is also usually greater at the north. Corn thus presents a rather unique instance of a plant which by culture and acclimatization has come to thrive better in an alien home. This result will be seen later to depend upon a general law.

In no other section of the world, however, does the yield of corn in any way equal that of the corn belt of the United States, or the seven corn surplus States from Ohio to Nebraska and Kansas, inclusive. To be sure corn is grown, and one or more of its many varieties may thrive, in every State and Territory of the Union, yet in 1899 six States raised nearly 60 per cent of the crop, and twenty-five States now produce 95 per cent of the total yield. As an illustration of the great acreage devoted to corn, it has been said that the eleven cotton States as a whole give a greater area to corn than to cotton.

The better adaptability of the high temperate regions to corn is not altogether an unmitigated advantage. In the United States the seasonal limits preclude the possibility of more than one crop a year, though in southern California, with the aid of irrigation, two crops in one year have been raised, and in most tropical regions two and sometimes three crops a year are regularly grown on the same ground. Not only does the change in latitude modify, but transportation in longitude produces effects almost as notable. According to Darwin, American white dent corn cultivated in Germany for three years without selection was greatly reduced in size, lost its dented character, and assumed a yellow color common to corn in that country. Changes almost as marked have occurred in a few generations in corn from one part of the United States when removed to a distant part. According to Professor Beal a soft gourd corn from Texas, after cultivation in Louisiana for twelve years, became a hard flint with larger cob. An 8-rowed flint corn from the north, after seven years' cultivation without selection in Ohio, became much dented and the number of rows increased from 12 to 20.

The ratio of weight or size of total plant to grain varies according to somewhat definite laws. In the United States there is, generally speaking, a uniform decrease in the height of the plant from 12 feet in the Gulf States to 6 feet in Canada. Accompanying this dwarfing of the plant by the progressive increase of cold, there is, up to a certain latitude, an almost equal increase of grain. Hence, there would seem to exist for any given variety a certain fixed optimum ratio between plant and grain; this ratio has not been determined, however, and seems to have received but little attention. Another concomitant, or it may be result of this dwarfing by cold, is a prominent tendency of the dwarfed varieties to develop suckers. This tendency may also appear locally whenever the growth of the stem is retarded, and is probably due to sustained activity of the roots and the subterranean portions of the stem, which retaining the higher temperature of the soil, promote the development of new stems. Dwarfing at the north is further accompanied by a shortening of the internodes of the stem and an increased leaf surface. This increase of foliage in high latitudes is undoubtedly due, in large part, to the necessity for more rapid assimilation in the shorter season, the special function of the leaf being, as we shall see, to absorb the energy of the sun's light and to control, by means of respiration, the food supply and the water content of the plant. Regarding the differences in composition of the grain but little of a conclusive nature is established; as with many other changes this is masked by changes in the food supply depending on the chemical activities of the soil, which activities depend in turn upon the climate. From an economic basis, perhaps the most conspicuous and certainly the most valuable feature of the corn plant is its elasticity with respect to the length of the period of growth: the varieties cultivated in the United States require at the south from one hundred to one hundred and seventy days for the best yield, while Blodgett mentions, in the valley of the Red River of the North, varieties that mature in sixty days.

Turning now to an analytical survey of the separate factors that constitute climate and their individual effects on the plant and on seed, brevity demands that all reference to methods and experiments be omitted and that only conclusions be stated. Introductory to this survey there will be given a review of the relations of the plant to its environment in general, and then of the means and methods of its response and adjustment to this environment, or what is termed the physiology of the plant. All that can be undertaken here is a compilation and a classification of results, and while the general subject is the relation of climate and corn, many of the statements that follow are generalizations that apply as aptly to other crops. In view of the difficulty of separating the individual from the combined effects of the meteorological elements, and the paucity of reliable data, this treatment will necessarily be fragmentary.

The effects of climate on corn may be appropriately classified as immediate, intermediate, and incidental.

Professor Storer has tersely and beautifully said that the prime object of agriculture is to collect for purposes of human aggrandizement as much as may be possible of the energy that comes from the sun in the form of light and heat. Now the working capacity of sunshine is, according to Kelvin, one-horse power for every 7 square feet of surface. Measured by the standards of mechanics, how inefficient and wasteful an engine is our agriculture at its best. The atmos-

phere is directly the source of 95 per cent of the material in the total plant and of 98 per cent of the matter in the grain of corn. The plant is an elaborate machine that absorbs and transforms energy, utilizing solar radiation to digest carbon dioxide in the leaves and to combine into vegetable organs and tissues the gases of the air with the elements supplied by the soil. When we remember that the amount of energy available, the food supply, and, consequently, the amount of matter stored, all depend directly upon meteorological conditions, we realize how overwhelming is the influence of climate.

A grain of corn once matured is as inert as a pebble until heat and moisture are applied; then a sprout and a root appear, each for a separate function, the one for absorbing etherial waves, the other for absorbing water. In addition to heat and moisture, oxygen is absolutely essential to germination, as well as to all subsequent growth. The importance of moisture will be appreciated when we recall that water performs at least four distinct offices: first, directly as a food, being united in the leaves with carbon to form the carbohydrates; second, as a solvent for the nutritive matters in the soil; third, as the vehicle which transports the soluble food through the roots and stems to the leaves; and, finally, as a cooling device, since, through evaporation, water largely controls the temperature of the plant. The "free water of vegetation," as it is called, or the water of the juices, comprises from 70 to 90 per cent of corn in the fodder stage, while the "combined water of vegetation," or the water that remains after the plant is air-dried, is 12 per cent in a kernel of corn.

The immediate effects of climate will be better understood by glancing first at its intermediate effects through the medium of the soil and through the food suppy. Climate originates soil and all the capacities of the earth for tillage, and it is at the same time more than soil or tillage. For in a truly "good year" the worst tilled soil returns a more bountiful harvest than it is possible with all our industry to extort from the best tilled soil in a "bad year." The oasis differs from the desert only in the item of water supply, and a given climate does not result primarily from the nature of the earth's surface; on the contrary, that surface is determined almost wholly by climate. The agencies that produce, and are producing arable areas from the seemingly impervious and indurate rocks, must continue their action perennially if the soil is to maintain itself. Indeed, the reverse metamorphosis is constantly at work. The greater part of the known rock formations were once in the form of soil, and chemical, physical, and even vital forces are continually engaged in the work of rock making, as well as rock breaking, so that an important office of agriculture is to oppose this cyclic law of nature, and to counteract the retrogressive tendency from soil to rock.

Primarily, the soil is a reservoir of moisture and plant food; but hardly secondary is its office as a vast laboratory, wherein during the warmer seasons, countless complex chemical agencies and numberless microscopic organisms operate unceasingly. Indeed, the relations of climate to the plant through the medium of the soil are so intimate and vital that no just idea of their importance can be given here. These relations may be classed as physical, chemical, and biological.

The physical texture of the soil determines its conductivity for heat and its content of water and air, both of which in proper proportions are essential to the chemical and biological functions. Moreover, the water content, through its power to absorb, transform, and conserve radiant energy, controls the temperature of the soil. Finally, soil temperature is far more effective than the temperature of the air. Heat is well known to accelerate diffusion, solution, osmotic action, and evaporation. Now these physical processes are precisely those that perform the chief, almost the entire work involved in plant nutrition and growth. Hence, a high soil temperature is essential not only for the life of the plant itself but also for the ventilation and the life of the soil, a healthy soil being very appropriately called a living mass. On an average, 40 per cent of the radiant energy incident on the soil is absorbed, conducted downward, and stored in the form of heat, 60 per cent being lost to the soil by reflection, radiation, and evaporation. The more water a given volume of soil contains at a given temperature the greater its latent heat. If the sun impart equal quantities of heat to equal volumes of sand, clay, humus, and water, then for each degree of rise in temperature of the water the humus will rise over 2°, the clay about 4°, the sand about 5°. Thus, on account of the high specific heat of water, with a normal amount of water in the soil, the effect is to retard the warming of the soil in the spring; but when a wet soil is once heated it is, of course, a great reservoir of energy. Again, by virtue of this property of high specific heat, water in the form of warm rain is a very fertile source of heat for the use of the crop. On the other hand, cold rains and the melting snows of spring are equally pernicious from this point of view. The work of evaporation in maintaining the ground at a moderate temperature under the fierce sun of summer is evident from the consideration that the evaporation of 1 pound of water from 1 cubic foot of soil will reduce the mean temperature of that soil by about 10°. Actual measurements confirm this theoretical conclusion by showing that during the summer months the average temperature of the 3 inches of soil nearest the surface is as much as 14° lower than that of the air. This difference between the temperature of a moist soil and the air above it is augmented by any condition that increases evaporation; consequently it increases with the increase of wind velocity. Because of this cooling effect of evaporation, too, wet soils are usually cold soils, for loss of heat by evaporation more than counterbalances the gain in heat absorbed by the soil water, so that the best percentage of water is the least amount that will just float the solid food and maintain the plants in a healthy state of turgescence.

Oxygen is as indispensable to the chemical life of the soil as it is to animal life. Both oxygen and nitrogen are essential to the biological processes, and both the chemical and biological activities in the soil are as indispensable to the crop as are sunshine and showers.

The importance of right proportions of water and air in the soil is further shown by the fact that the process of decay, whereby organic material is turned into humus and made available to the plant can not go on without an abundant supply of oxygen. A soil that contains too much water contains too little air. The ferments thrive best at a temperature of 85° to 95°, and when the soil contains from one-half to one-third the amount of water required for saturation. The ultimate source of the nitrogen found in vegetable matter is the air, and plants are unable directly to utilize it in a free state. The bacteria, which are chiefly concerned in maintaining the available supply of nitrogen in the soil, are able to work only during the warm seasons, and their activity depends directly on the temperature of the soil, being a maximum at 98°. On the other hand, light is inimical to the life and activity of these soil bacteria, a fact that may have some bearing on the rapid growth of corn during hot nights, inasmuch as the work of the microorganisms in feeding the roots is then facilitated. That corn germinates best at the high temperature of 98° to 100° is, undoubtedly, due to its tropical origin. For Professor Davenport shows that the attunement of plants to environment as regards temperature has its origin, not in processes of selection, but in the modifications of protoplasm by temperature itself.

Granted that the soil is porous enough and dry enough to admit the air readily, ventilation is facilitated by the unequal heating of night and day, and by nonperiodic temperature changes as well. As the air within the soil is heated it expands, and some of it is forced downward to the deeper layers; when it cools it contracts, and free air is drawn into the soil. The same effect is produced by barometric changes; the passage of areas of high and low pressure has been found to influence the flow of water from drains to the extent of 15 per cent, thus showing an unexpected movement of air in the soil. The corn belt lies entirely within the region of maximum frequency and intensity of barometric oscillations in the United States. Strong, and particularly gusty winds, by a measurable aspiratory action, have also a significant influence on soil breathing.

Climate, as has been said, is typified by the average meteorological conditions of a season; but these are all more or less periodic if not erratic. The best crops demand a permanence of certain conditions during a certain stage of growth; thus, for example, permanency of the moisture is called for, while rains supply it intermittently. Again, the root hairs developed in a dry soil seem unable to thrive in a wet one, and new rootlets must be thrown out to meet the new conditions. The same is true of rootlets developed in a wet soil; so that, in a soil whose moisture content fluctuates rapidly within a wide range, the plant is constantly taxed to maintain itself.

A regular supply of warmth is more genial than sudden transitions from heat to cold. Knowing these things it is the part of husbandry to ameliorate the eccentricities of the climate in order to improve the crop.

The effects of climate on the crop through the medium of the soil are classed as intermediate; but it will be seen that some of these effects are as truly direct as are the effects of sunlight and the temperature of the air.

Having seen how heat, light, moisture, and the supply of gases operate to control the supply of those ingredients that are furnished by the soil and that constitute in the main the ash of the plant, we return now to the immediate effect of these elements on the vital processes and assimilation.

The elaboration of the various elements that are found in a normal corn plant, of which there are about 14, takes place exclusively in the presence of the chlorophyl, or green matter of the leaves and stems, and only under the energy of sunlight. Heat alone is powerless to begin or to carry on this work, yet a relatively high temperature is nevertheless essential.

In the presence of sunlight the leaf pores, or stomata, open wide to admit a freer circulation of air in the blades. Of these pores there are in the blade of corn about sixty thousand to the square inch on the upper surface and ninety thousand on the under surface; their dilation and contraction and consequent control over ventilation and respiration is proportional to the intensity of sunlight, and hence very intense sunlight may of itself cause wilting independently of its heating effects.

The orange and yellow rays are the most active in the work of decomposing carbon dioxide; the relative energy of the different colors for this purpose correspond closely with their relative brightness.

While light is indispensable to the assimilation of carbon dioxide, it undoubtedly exerts a directly retarding influence on growth proper, or cell multiplication, but the beneficial effects of the higher temperature that accompanies daylight more than counteract this. The blue rays, opposing certain chemical changes, are those most effective in retarding growth. Sachs showed that for many plants when kept at a uniform temperature the rate of growth gradually increases during the night and is a maximum shortly after daybreak. This effect of light is opposed to the effect of the diurnal temperature; heat and light increase transpiration, which means a loss of water, and hence less growth. This sensitiveness and response of protoplasm to light is the result of the chemical changes wrought therein by the light.

By osmotic action the root hairs imbibe the liquid food that surrounds them; capillary and osmotic actions carry this supply to every part of the plant, to the tip of every blade, which is not only bathed in air, but has its microscopic interstices permeated with it. Here, in the leaf cells, the carbon dioxide of the air, which is practically an invariable quantity, comes in contact with the water that has been brought from the roots. Here, too, the energy of the ether waves, which we call light, but which the vegetable cell recognizes only as force, or a mode of motion, causes the carbon dioxide to part with some of its oxygen in exchange for some of the hydrogen contained in the water. Thus, there is formed within the cell a substance composed of carbon, hydrogen, and oxygen, the exact molecular structure of which is not known; in this process some of the oxygen is freed and thrown off by transpiration. By the introduction of the molecule of carbon dioxide into the cell the equilibrium in the atmosphere of that gas is disturbed and another molecule diffuses into its place; for this gas exists and behaves as if it were the only gas present in the space under consideration, the same law being true for each of the gaseous elements whose mixture constitutes what is called the atmosphere. The consumption of carbon dioxide tends constantly to produce a vacuum in the carbon dioxide atmosphere, and the law of diffusion as constantly tends to maintain the supply. If molecules of hydrogen are withdrawn from the fluid contents of the cell, instantly osmosis and diffusion tend to replace them; the same is true of the solid particles in solution. Assimilation within the cells of the leaves perpetually destroys the equilibrium of osmotic pressure, hence this pressure creates a constant flow toward the seat of demand. Evaporation from the leaves, which is proportional to temperature and is accelerated by winds, as is the supply of carbon dioxide, operates in the same direction, viz, to destroy the equilibrium in the leaf cells and channels, and consequently the tiny streams from the rootlets are hastened onward with their precious stores of food. Cold not only stiffens the sap and retards its flow, but also slackens molecular motion and hinders the chemical reorganization of the elements. The process of evaporation proper is, however, almost independent of the processes of nutrition, and is rather a "necessary evil." The most rapid growth frequently occurs under precisely those conditions that make evaporation least rapid.

The quantity of water that passes through the plant and is transpired and evaporated is enormous. The average is about three hundred parts of water to one of dry matter. According to experiments by Professor King of the Wisconsin Experiment Station, dent corn used three hundred and ten tons, and flint corn two hundred and thirty-four tons of water for each ton of dry matter produced. This same experimenter supplied growing corn with water as fast as it could be used to advantage, and found that the crop consumed during its season of growth water equivalent to a rainfall of 34.3 inches, and yielded more than four times as bountifully as a very large crop grown under the best natural conditions of rainfall in Wisconsin. And he concludes that "large as this movement of water is, it is seldom great enough to enable a moderately fertile field to produce its largest crops." And these tests in Wisconsin merely confirm a conclusion that is becoming quite general, and is prompting the advocacy of irrigation even in the humid regions. Moreover, the quantity of water producing a given result increases with the fertility of the soil, and, according to Wollny, the soil moisture produces its maximum results only when

the plants are grown in the strongest light. The value of a given quantity of rainfall for the crop increases as the number of rains, and what has been called the useful remainder of rainfall is only 20 per cent of the total amount, percolation and evaporation accounting for 80 per cent. Percolation is a fertile source of loss of the valuable soil nitrates, especially in the wet fall and winter seasons, when the corn field is bare and a large proportion of the water escapes downward. Rain, like snow, is the "poor man's fertilizer," bringing down, per acre, in the course of a year, at Rothamsted, England, 24 pounds of salt, 4½ pounds of nitrogen, 18 pounds of sulphuric acid, and much carbon dioxide, which is a valuble solvent. A single drought late in July or August, during the critical period of tasselling or earing, has cost the Western States 100,000,000 bushels of corn. A wet harvest time results often in a dilute sap, and, consequently, a soft grain, which is the prey of microbes and fungi that thrive in dampness. These miscellaneous considerations show that in many unsuspected directions the question of moisture is a vital one, and that to husband it is the first duty of the farmer.

Some of the less important incidental relations of climate and corn, such as electricity, winds, frost, insect enemies, and diseases remain to be mentioned. Electricity artificially applied to the roots by charging the soil, and to the leaves by means of the electric light, have both repeatedly been found to stimulate the growth, and in some instances, greatly to accelerate it. Recent experiments show that when green leaves are exposed to direct sunlight there is developed a difference of electrical potential between the illumined and the shaded surfaces, amounting in some cases to .02 volt, but the bearing of this fact upon assimilation is not well known. Atmospheric electricity is a fertile source of ozone, or condensed oxygen, which is particularly active in the production of nitric acid. Electricity stimulates protoplasm, the ultimate vital principle, and may determine the character of its activities, but under natural conditions this element is believed to have but slight influence.

Winds have been called the vehicle of climate; but we are concerned here with their incidental and accidental features only. In the semi-arid regions broad, unprotected fields are frequently swept by high winds that remove two or three inches of the light surface soil, and with it the seed of the young crop. Strong winds during the period of maturity of the corn crop, especially after the roots have lost their vigor, by "lodging" the corn and subjecting it to the dangers of decay on the wet ground are often the occasion of great inconvenience, if not of serious damage. But the most remarkable immediate phases of this meteorological element are the hot winds that frequently ravage the corn belt west of the ninety-fifth meridian from Dakota to Texas. In 1888 ten Kansas counties reported an estimated loss of 21,000,000 bushels from this cause. These devastating blasts (fed by descending currents of air so hot and so dry as to abstract moisture faster than transpiration can supply it, and hence literally to burn the plants) are perpetuated by conditions of drought, and are most fatal during the critical stages of tasseling and earing. The moisture content of the soil and the nature of the winds have intimate reciprocal relations, and truly dessicating winds are improbable for any protracted period over a well-watered region.

Because it possesses such exceptional recuperative powers as to make it almost invulnerable to the hot winds of the semiarid west, it is worth while in this connection to mention kaffir corn, which the Department of Agriculture introduced in the early eighties from Africa, where it attracted attention on account of its peculiar drought resisting property, due largely to the fact that its roots penetrate to the depth of 18 or 20 inches.

While light frosts in autumn (by hastening maturity in a dangerous time) often prove wholesome, and while the value of the frosts of winter in disintegrating and preparing the soil for the subsequent crop is so well known as to require only a passing mention, on the whole the range of corn is much restricted and the crop imperiled by this element. Experts of the Department of Agriculture assure me that they regard it as quite probable that a kind of corn may ultimately be developed which will possess immunity from frost; but as yet the average interval between spring and autumn frosts virtually limits the growing season. The character of a winter may also affect the vigor and germinating power of the grain that is stored as seed for the subsequent crop.

Seasonal characteristics have practical connection, too, with the insect pests and diseases of corn. Not only during the crop season are these pests largely at the mercy of the elements, but fitful winters are sure to prove destructive to them, for during the bright, warm days eggs are hatched, chrysalides matured, and insects lured from their retreats, only to be caught and destroyed by the sudden cold waves. The fungus diseases, such as rust and smut, are carried by winds and are favored by wet seasons, dews, and moist atmosphere.

Many important facts bearing directly on the subject of this paper are found in the extensive report of 1891, above alluded to, by Professor Abbe, on the Relations of Climate to Crops. They will here be summarized, and while these deductions apply with equal weight to all annual crops, their importance is especially patent in the case of a crop with so extensive a range as corn.

Growing out of the interrelations of climates and plants there are two laws that admit of tolerably definite statement. These are the law of habit and the law of economy. Wherever the supply of heat is always sufficient the variations of moisture control, and wherever the supply of moisture is always sufficient the periodicity of heat controls the whole development of the plant. In other words, if the periodicity of heat is such as to warn of the necessity of economy, the whole life of the plant is determined by the course of heat, and the same for moisture. On the plains of South America, for instance, the dry season exerts the same influence as our northern winters. In the Middle States, not the rainfall of spring so much as what seems an instinctive knowledge of the approaching drought, stimulates the corn to a hasty development; at the north the growth is correspondingly accelerated by the knowledge of the rapidly approaching frosts of autumn. So sensitive is the plant to the changes of climate that even the ordinary seasonal irregularities have a strong influence; the general disposition acquired by the seed in a single dry or wet, warm or cold, early or late, season prepares it by virtue of that experience to become the best seed for planting in anticipation of another such season as that in which the seed was matured. This tendency is illustrated by the well-known fact that dwarfed varieties of corn from northern latitudes, when cultivated to the southward, mature earlier, are hardier, and more prolific than the native varieties. A corollary of great practical promise is that in a region habitually or frequently dry, corn raised in the driest years should be preserved for seed, as likely to be far better than any that may be brought from a distance. Hence the common, if not universal, practice of using seed grown in the preceding year is strongly condemned. By always utilizing seed that has been raised in the driest years one may hope speedily to develop varieties whose vegetating period will be so short that the crop will rarely be injured by the hot winds of July or August. And a similar rule would apply for any desired disposition we may seek to impress upon the seed.

In the light of these facts it is suggested that irrigation may come to be used as a temporary device to promote the evolution of new varieties that can be cultivated without irri-

gation. On the other hand, recent careful work in France has demonstrated that when the plants are forced to their maximum yield by irrigation the seed thereby suffers a marked deterioration, and that for continued maximum results the seed must be raised on dry soil.

Climate being inviolable and inexorable, what hope is there that the agriculturist shall be emancipated from the tyranny of frost and drought? Clearly, he must attain this by work on the soil and on the plant.

By utilizing vast stores of energy in the form of fuel man banishes the rigors of winter, thus creating artificial conditions of shelter and heat, by aid of which he has supplemented the process of acclimatization. Thus, also, must he cooperate with nature in behalf of the plant; he must combat her malignant aspects by intelligent selection; by scientific methods of culture he must supplement her beneficent efforts on behalf of the human race.

METHODS EMPLOYED IN THE DISTRIBUTION OF WEATHER FORECASTS.

By JAMES BERRY, Chief of Climate and Crop Division.

After making the most accurate prognostications practicable the Weather Bureau has no more important duty than to give them the most extended publicity that its facilities afford.

As with other classes of information the newspapers are the media for most effective work, and as every important newspaper in the country gives prominent place to the weather forecast, a dissemination is obtained so extensive as to be almost incalculable. The cities, towns, and thickly populated communities, through the newspapers have, therefore, not suffered for lack of weather information, but the rural districts have been less fortunate, and the devising of plans by which the agricultural classes might receive the forecasts in time to guide them in their daily avocations has been a difficult problem.

The Bureau since its establishment has from time to time considered many methods by which the forecasts might be made to reach the agricultural classes in time to be of use, and aside from the efforts of its officials, suggestions from others interested in the subject have been numerous. A vast majority of the latter, however, from one cause or another, have been impracticable, so that after the thirty years of experience the Bureau accomplishes its distribution of forecasts and special warnings principally through (1) the newspapers; (2) the system of telegraphic distribution, at Government expense, under direct supervision of Weather Bureau station officials; (3) the voluntary cooperation of railroad and telephone companies, public spirited citizens, and postmasters.

The organization of the local State Weather Services during the eighties tended to augment the interest taken in this subject and resulted in the adoption of the systems that now give to nearly every part of the country having mail or telegraph facilities, daily forecasts and warnings of unusual weather conditions.

The country has been divided into districts with a center of distribution for each, from which the forecasts are telegraphed daily, except Sundays and holidays, to subcenters for redistribution by telephone, mail, or railway bulletin service. The distributing points receive predictions by telegraph or telephone usually by 10:30 or 11 a. m., seventy-fifth meridian time, and the substations served by mail get theirs within a few hours thereafter, depending upon distance and mail connections.

Independent of the distribution attained through the press, there are now published daily more than 100,000 weather bulletins, much the greater part being in the form of postal cards printed from the telegraphic report received by postmasters at distributing points and sent to the outlying towns for display in suitable holders in post offices and other prominent places. Postmasters at distributing offices are largely relied upon in making this distribution. By a simple printing device the franked cards are rapidly printed in bold type, and the earliest mails carry them quickly to their destination. Logotypes are used, comprising a vocabulary of about 125 of the popular weather terms in which the weather forecasts are usually expressed. The forecast cards are stamped in a very expeditious manner, it being possible for one person to print several hundred cards within a few minutes. In the whole experience of the Weather Bureau no system has been tried that has proved more effective or inexpensive than this extremely simple method of stamping the forecasts by hand on postal cards bearing the official frank.

Other and older systems for conveying weather information have not been abandoned, viz, the flag displays and sound signals. The former consists of a series of five flags, which are displayed singly or in such combinations as to represent weather conditions. The sound signals are a code of steam whistle blasts which may be heard for miles in the country adjacent to the mill or factory sounding the same. This system is quite extensively used in some States, and has proved very popular. The code employed is the following:

A warning blast of from fifteen to twenty seconds duration is sounded to attract attention. After this warning the longer blasts (of from four to six seconds duration) refer to weather, and shorter blasts (of from one to three seconds duration) refer to temperature; those for weather are sounded first.

Blasts.	Indicate.
One long	Fair weather.
Two long	Rain or snow.
Three long	Local rain or snow.
One short	Lower temperature.
Two short	Higher temperature.
Three short	Cold wave.

By repeating each combination a few times, with intervals of ten seconds, liability to error in reading the signals may be avoided.

EXPLANATION OF WEATHER FLAGS.

When number 4 is placed above number 1, 2, or 3, it indicates warmer; when below, colder; when not displayed, the temperature is expected to remain about stationary. During the late spring and early fall the cold wave flag is also used to indicate anticipated frosts.

Quite a variety of methods other than the aforementioned have been tried from time to time, some giving much satisfaction, among which may be mentioned the plan of attaching to letter boxes a suitable frame, the card forecasts being placed therein by the letter carriers in making their rounds for the collection of mail. This system is in vogue in several cities and is very popular. The street cars are also used to a considerable extent, the forecasts being posted in the interior of the cars in bulletin form, and in some instances symbols representing the flags are displayed from the sides or tops of the cars.

Within the year 1900 there has been utilized what now promises to be one of the most effective methods of reaching the agricultural classes, viz, the rural free mail service. Wherever it has been possible to reach the distributing post office with the telegraphic forecasts in time to catch outgoing carriers the service has been given to farmers along their routes. By this means it has been possible to place in the hands of more than

400 farmers on a single route a copy of the official forecasts within a few hours after its issue. This new feature of the postal service is gaining in popularity and is being rapidly extended, and it will be utilized as fully as possible by the Weather Bureau. The forecast is stamped by the logotype system previously referred to upon a small slip of paper and a copy furnished each carrier on the rural carrier's route. To illustrate the form in which the forecast reaches the farmer the following specimen blank containing an ordinary forecast is reproduced:

Form No. 1043 A—Met'l.

WEATHER FORECAST.

PUBLISHED BY AUTHORITY OF THE SECRETARY OF AGRICULTURE.
Willis L. Moore, Chief U. S. Weather Bureau.

RAIN TO-NIGHT AND TUESDAY;
WARMER TO-NIGHT.

The increase that has been made in the distribution of the forecasts of the Weather Bureau since its transfer from the War Department to the Department of Agriculture is illustrated by the following table:

Distribution of daily forecasts, special and emergency warnings.

Year.	By telegraph or telephone, at Government expense.			Without expense to the Government, by—				Grand total.	Per cent of increase.
	Daily forecasts.	Special warnings.	Emergency warnings.*	Mail.	Telegraph or telephone.	Railroad telegraph.	Railroad train.		
1892	1,868	592	.....	689	533	1,204	1,462	6,368	....
1893	1,613	632	.....	3,065	620	2,129	1,264	9,323	46
1894	1,778	609	.....	4,361	947	2,219	1,318	11,232	21
1895	1,920	633	3,494	11,732	1,239	2,346	1,218	22,582	102
1896	1,581	790	3,494	22,642	1,712	3,550	1,939	35,503	57
1897	1,886	613	3,481	37,913	2,347	3,196	2,258	51,694	46
1898	2,098	592	3,461	50,032	2,623	3,354	2,505	64,675	25
1899	1,762	768	6,769	56,308	2,778	2,902	2,423	73,710	14
1900	1,857	791	7,096	76,593	8,297	3,314	2,423	100,371	36

*Emergency warnings go to all places receiving the ordinary forecasts and special warnings. This system of stations was established in 1895.

It is the desire of the Department to further increase the usefulness of the service wherever possible, and any community not now receiving the benefit thereof will have its interests carefully considered and served, if possible, upon application to the Weather Bureau official in charge of the territory in which such community may be situated. Communications in connection with this subject, addressed "U. S. Weather Bureau official in charge" (giving the name of the central station of the district in which the writer may be located), will receive prompt and considerate attention. These central stations and districts are as follows:

Montgomery, Ala.; Phoenix, Ariz.; Little Rock, Ark.; San Francisco, Cal.; Denver, Colo.; Jacksonville, Fla.; Atlanta, Ga.; Boise, Idaho; Springfield, Ill.; Indianapolis, Ind.; Des Moines, Iowa; Topeka, Kans.; Louisville, Ky.; New Orleans, La.; Baltimore, Md. (for Delaware and Maryland); Boston, Mass. (for New England); Lansing, Mich.; Minneapolis, Minn.; Vicksburg, Miss.; Columbia, Mo.; Helena, Mont.; Lincoln, Nebr.; Carson City, Nev.; New Brunswick, N. J.; Santa Fe, N. Mex.; Ithaca, N. Y.; Raleigh, N. C.; Bismarck, N. Dak.; Columbus, Ohio; Oklahoma, Okla. (for Oklahoma and Indian Territory); Portland, Oreg.; Philadelphia, Pa.; Columbia, S. C.; Huron, S. Dak.; Nashville, Tenn.; Galveston, Tex.; Salt Lake City, Utah; Richmond, Va.; Seattle, Wash.; Parkersburg, W. Va.; Milwaukee, Wis.; Cheyenne, Wyo.

OBSERVATIONS AT HONOLULU.

Through the kind cooperation of Mr. Curtis J. Lyons, Meteorologist to the Government Survey, the monthly report of meteorological conditions at Honolulu is now made partly in accordance with the new form, No. 1040, and the arrangement of the columns, therefore, differs from those previously published.

Meteorological Observations at Honolulu, January, 1901.

The station is at 21° 18′ N., 157° 50′ W.
Hawaiian standard time is 10h 30m slow of Greenwich time. Honolulu local mean time is 10h 31m slow of Greenwich.
Pressure is corrected for temperature and reduced to sea level, and the gravity correction, −0.06, has been applied.
The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.
The rainfall for twenty-four hours is measured at 9 a. m. local, or 7.31 p. m., Greenwich time, on the respective dates.
The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet, and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m., Greenwich time, or 2.29 a. m., Honolulu time.								Total rainfall at 9 a. m., local time.
				Temperature.		Means.		Wind.			Sea-level pressures.	
		Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.	Average cloudiness.	Maximum.	Minimum.	
	*	†	†			‡	‡		§				
1	29.93	69	62.5	.....	.....	56.7	69	nne.	0-3	10	30.00	29.92	0.00
2	29.91	63	59	77	66	58.3	62	nne.	1-3	0-1	29.99	29.85	0.00
3	29.90	62	60	77	62	59.3	72	w-ne.	1-0	1-3	29.97	29.86	0.00
4	29.88	69	66	75	60	61.7	83	s.	1-0	10-8	29.94	29.85	0.01
5	29.94	63	62.3	79	63	65.5	79	s.	1-0	3	29.96	29.87	0.00
6	29.94	65	63	77	63	64.3	83	s-ne.	1-0	4	30.00	29.90	0.00
7	29.97	69	66.5	80	65	64.0	75	sw-ne.	1-0	3-0	30.01	29.89	0.04
8	30.03	72	65	79	67	64.5	73	ne.	3	1-4	30.06	29.97	0.06
9	30.06	72	66	78	68	61.7	64	ne.	4	4	30.11	30.02	0.03
10	30.05	71	67	78	71	62.5	67	ene.	4-5	4	30.15	30.04	0.05
11	30.02	63	61.7	79	70	63.5	73	ne.	3	4-1	30.10	29.96	0.00
12	29.99	61	59	78	62	62.3	79	w.	0-1	0-1	30.06	29.96	0.00
13	30.02	68	66	79	60	61.5	73	sw-ne.	1-3	0-5	30.06	29.96	0.46
14	30.00	72	66	72	68	66.3	88	nne.	2-7	10	30.08	29.97	1.25
15	29.92	66	64	76	70	65.3	75	ne.	5-2	5	30.03	29.93	0.11
16	29.90	63	62.3	78	66	65.7	82	sw-w.	1	1-6	29.97	29.86	0.00
17	29.96	69	65	79	63	64.5	79	w-nne.	1	1-5	29.99	29.85	0.01
18	30.04	68	61	72	68	60.7	74	nne.	5-7	2	30.06	29.97	0.01
19	30.06	69	60	73	67	55.5	59	nne.	6-4	1	30.12	30.02	0.00
20	30.08	70	62.5	75	68	57.3	61	ne.	4-2	3	30.13	30.05	0.18
21	30.08	72	64	76	66	58.7	61	ne.	4-5	3	30.14	30.06	0.00
22	30.05	72	61	77	71	60.0	63	ne.	4	4	30.12	30.05	0.01
23	30.03	70	64	76	71	59.7	63	ne.	4	3	30.12	29.99	0.07
24	30.04	72	65	77	68	61.3	67	ne.	4	3	30.11	30.00	0.00
25	30.06	66	64.5	79	70	62.0	69	ne.	3	6	30.10	30.02	0.17
26	30.11	70	63.5	80	64	63.3	73	ne-s.	1	4	30.14	30.05	0.00
27	30.04	71	62.5	77	63	60.0	65	ne.	3-0	3	30.17	30.04	0.00
28	29.93	67	63.5	77	65	59.0	63	ne.	3	3	30.08	29.93	0.00
29	29.94	66	63	79	66	62.3	74	e-ne.	3	4	29.98	29.88	0.00
30	29.91	63	62	80	63	63.3	75	ne-s.	1	3	29.98	29.88	0.00
31	29.89	63	62	79	63	64.0	83	sw.	1	6	29.95	29.85	0.64
Sums..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3.10
Means.	29.990	67.6	63.2	77.3	65.9	61.9	73	.....	2.4	3.6	30.05	29.95	−0.10
Departure..	+.049	.....	.....	.....	...	−1.1	−3.7	.....	.....	−0.9	.....	.....	.....

Mean temperature for January, 1901 (6+2+9) ÷ 3 = 71.3; normal is 70.1. Mean pressure for January, 1901 (9+3) ÷ 2 = 29.998; normal is 29.949.
*This pressure is as recorded at 1 p. m., Greenwich time. †These temperatures are observed at 6 a. m., local, or 4.31 p. m., Greenwich time. ‡These values are the means of (6+9+2+9) ÷ 4. §Beaufort scale.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Manuel E. Pastrana, Director of the Central Meteorologic-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the Boletin Mensual. An abstract, translated into English measures, is here given, in continuation of the similar tables published in the MONTHLY WEATHER REVIEW since 1896. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart IV.

Mexican data for January, 1901.

Stations.	Altitude.	Mean barometer.	Temperature. Max.	Min.	Mean.	Relative humidity.	Precipitation.	Prevailing direction. Wind.	Cloud.
	Feet.	*Inch.*	° *F.*	° *F.*	° *F.*	%	*Inch.*		
Chihuahua	4,639	25 38	64.0	28.2	47.5	60	0.00	w.	w.
Leon (Guanajuato)	5,934	24.34	76.5	37.0	56.8	58	0.03	nnw.	sw.
Linares (Nuevo Leon)	1,188	28.81	86.0	37.4	60 6	76	1.85	s.	s.
Mazatlan	25	29.98	78.3	58.5	70.3	77	0.02	nw.	sw.
Mexico (Obs. Cent.)	7,472	23.00	73.9	36.7	55.6	54	.....	ne.	ne.
Morelia (Seminario)	6,401	.....	.....	.....	.....	.....	.....	.....	.....
Puebla (Col. Cat.)	7,112	23.42	75.2	37.9	57.2	59	.....	e.	sse.
Saltillo (Col. S. Juan)	5,399	24.83	73.4	32.0	53.8	76	0.87	n.	s.
San Luis Potosi	6,202	.....	.....	.....	.....	.....	.....	.....	.....
Tampico	38	..	.....	.....	.....	.....	.....	.....	.....
Zapotlan (Seminario)	5,078	.....	.....	.....	.....	.....	.....	.....	.....

RECENT PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined list of titles has been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau:

Popular Science. New York. Vol 58.

Watts, H. M. The Weather vs. The Newspaper. P. 381.

Scientific American. New York. Vol. 84.

—— A New Flying Machine. [Davidson's.] P. 72.

Nederlandsch Tijdschrift voor Meteorologie, Groningen. 1 Jahrg.

Sieberg, A. Over Veranderlijked der Temperatuur en de oorzaken van de grootere schommelingen in de temperatuur te Aken. P. 98.

Proceedings of the Royal Society. London. Vol. 67.

Lockyer, Norman, and Lockyer, W. J. S. Solar Changes of Temperature and Variations in Rainfall in the Region surrounding the Indian Ocean. P. 409.

Astrophysical Journal. Chicago. Vol 13.

Newcomb, Simon. Period of the Solar Spots. P. 1.

Himmel und Erde. Berlin. 13 Jahrg.

Neesen, F. Ueber Gewitter und Blitzableiter. P. 145.

Comptes Rendus de l'Académie des Sciences. Paris. Tome 132.

Lannelongue, Achard et Gaillard. De l'influence du climat sur l'évolution de la tuberculose pulmonaire expérimentale. P. 114.

Angot, Alfred. Sur la relation de l'activité solaire avec la variation diurne de la déclinaison magnétique. P. 254.

Journal of School Geography. Lancaster, Pa. Vol. 5.

Jefferson, M. S. W. Weather Map Exercises for High School Pupils. P. 51.

La Nature. Paris. 29me année.

Plumandon, P. R. Les orages à neige. P. 171.

Cunha, A. da. L'Observatoire Météorologique de Trappes. Cerfs-volants et Ballons-sondes. P. 179.

Meteorologische Zeitschrift. Band 18. *Wien.*

Billwiller, R. Bildung barometrischer Theilminima durch Föhne. P. 1.

Woeikof, A. Klima und Föhne der Dänemark-Insel, Scoresby-Sund. P. 5.

Valentin, J. Einige Ergebnisse der österreichischen Luftballons bei der internationalen Fahrt am 12 Mai 1900. P. 10.

—— Zur Einführung in die neueren Anschauungen über die Ursachen der Luftelektricität. P. 17.

—— Meteorologische Preisaufgabe. P. 25.

Pernter, J. M. Der zweite internationale Wetterschiess-Kongress in Padua. P. 25.

Hann, J. Teisserenc de Bort über den jährlichen Gang der Temperatur in grossen Höhen der freien Atmosphäre. P. 28.

Sieberg, A. Temperaturumkehrungen mit der Höhe zwischen Aachen und dem Aussichtsthurm im Aachener Walde. P. 33.

Polis, P. Ergebnisse der Luftdruckbeobachtungen zu Aachen 1838–1851 und 1858–1897. P. 34.

Wegrosta, K. Föhnsturm in Spital am Pyhrn. P. 35.

Fruh, J. Föhn in Fort Good Hope 66° 20′ N. am Mackenzie River (Kanada). P. 36.

Scholtz, M. Irrlicht oder elektrische Erscheinung? P. 36.

Less, E. Kugelblitze über Wolken. P. 39.

Pockels, F. Zur Bestimmung der Maximalstromstärke von Blitzen. P. 40.

Wolfer, A. Provisorische Sonnenflecken-Relativzahlen für das IV Quartal 1900. P. 42.

Philosophical Magazine. London. Vol. 1. *6th Series.*

Townsend, J. S. Conductivity produced in Gases by the Motion of negatively charged Ions. P. 198.

Schuster, A. Electric Inertia and the Inertia of Electric Convection. P. 227.

Quarterly Journal of the Royal Meteorological Society. London. Vol. 27.

Ekholm, Nils. On the Variations of the Climate of the Geological and Historical Past and their Causes. P. 1.

Curtis, Richard H. An improved Mounting for the Lens and Bowl of the Campbell-Stokes Sunshine Recorder. P. 63.

Dines, W. H. Weekly Death rate and Temperature Curves 1890 to 1899. P. 69.

Mellish, Henry. Seasonal Rainfall of the British Isles. P. 79.

Nature. London. Vol. 63.

—— Audibility of the Sound of Firing on February 1. P. 372.

LONG RANGE SEASONAL FORECASTS FOR THE PACIFIC COAST STATES.

By ALEXANDER McC. ASHLEY.

While some advances in the art of practical forecasting have been made during the past two decades, the trained meteorologist, whose investigations are conducted along conservative scientific lines, candidly admits, that for the present, at least, weather conditions can not be accurately forecast for any considerable period in advance of their occurrence. The greater portion of his time, therefore, has been devoted to the perfection of a method or system which enables him to give to the public an accurate and practical forecast of the weather conditions which may be expected to prevail over a given area during the following thirty-six hours. Under favorable circumstances these forecasts may be extended to embrace a two-day, or even a slightly longer period; on the other hand, weather conditions may change with such rapidity that to forecast successfully, for even a twenty-four-hour period, is attended with the greatest difficulty.

There are those, however, who have the hardihood to publish long-range forecasts which are couched in such ambiguous terms that they seem to be verified no matter what may actually be the subsequent weather conditions that they purport to foretell, or else upon rigid verification, are proven to be absolute failures. Indeed, the field of long-range forecasting is so overrun by unscrupulous persons of this class that the honest scientific investigator is loath to enter it. Nevertheless, long-range forecasting must be regarded as the ultimate aim of the meteorologist, and there can be no doubt that the persistent efforts of scientific men will at last be rewarded, and a process evolved whereby general conditions may be foretold with reasonable accuracy months in advance. Such forecasts are of two distinct kinds:

(1) Forecasts of the actual meteorological phenomena will occur upon a specified date.

(2) Seasonal forecasts, i. e., forecasts of the variations in average weather conditions during corresponding seasons in successive years.

Forecasts of the first class can be made only after the many and complex laws underlying meteorological manifestations have been discovered, but long before this has been accomplished, success in the formulation of seasonal forecasts, for certain sections, at least, will have been realized.

Several years ago an official of the United States Weather Bureau invited attention to some very interesting and instructive data in connection with a severe drought which had been experienced throughout the State of California. The data collected suggested the possibility of a long-range seasonal forecast of average rainfall conditions for the Pacific coast States, more especially for California, and the ingenious and attractive theory advanced created quite a stir and

gained many adherents among the agricultural and industrial interests throughout that section. It will be the purpose of this article to state this theory briefly, after which an effort will be made to determine the truth or falsity of the conclusions reached.

The climate of the Pacific coast, as compared with that elsewhere throughout the United States, is unique, and especially is this true in regard to rainfall. The year may be divided, roughly, into two seasons:

(1) A winter wet season, extending from October to March, the heaviest precipitation occurring in midwinter.

(2) A dry, almost rainless, season during late summer.

Briefly stated, the theory advanced seems to be about as follows:

During the wet season, moisture-laden westerly and southwesterly winds, blowing from the warmer ocean and coming in contact with the cooler air over the land, suffer such a reduction in temperature that a large part of the moisture they contain is condensed and precipitated. During the dry season, on the contrary, westerly winds from the cooler ocean or northerly winds from the dry continent prevail, the capacity of the former for containing moisture being increased after reaching the warmer land, a condition inimical to precipitation. While the prevailing winds account for the occurrence of alternate wet and dry seasons, it is necessary to look still further for the causes which give rise to a variation in the actual amounts of rainfall occurring in different years. When these latter causes are determined a seasonal forecast of the relative amount of rainfall for a certain specified year, as compared with the normal or average amount, becomes possible. An investigation of the surface water temperatures of the neighboring ocean reveals the fact that the water temperatures are higher than the land temperatures during the rainy season, and are correspondingly lower during the dry season; also, as might be supposed, the maximum rainfall occurs during the month in which the water temperature exceeds the land temperature by the greatest amount. Even slight variations in the water temperature during the winter months, therefore, will have their influence upon the rainfall over the contiguous land surface. Under the influence of the sun's rays alone water surfaces are quite uniformly heated, so that were it not for the distributing effect of ocean currents the temperature of the surface water in our oceans would depend almost entirely upon latitude.

Branching northward from the great equatorial current in the region to the north and east of the Philippine group of islands, we find the warm Japan Current (called by the Japanese the Kuroshiwo, or black stream), the Pacific counterpart of the great Gulf Stream of the Atlantic. The Japan Current, flowing in a northeasterly direction from the point where it branches away from the great equatorial current, crosses the northern Pacific in the vicinity of the Aleutian Islands, and finding no egress toward the land-locked north, returns equatorward along the western margin of the North American Continent. It is assumed that this current, in the latter portion of its circuit, plays an important part in determining the temperature of the westerly winds of the Pacific coast, and upon this assumption is based the hypothesis suggested. In its poleward course the Japan Current is constantly giving up a portion of its heat to the overlying air, and, to a limited degree, to the colder containing water walls which define its channel, so that its temperature decreases more or less uniformly until it again reaches tropical latitudes. From this it is inferred that any variations in the path of the current, whereby, perchance, it may penetrate to higher latitudes and traverse a longer circuit than usual, will produce a corresponding decrease in its temperature at any given point, say the California coast, along its southern path. With this lowering of the current temperature, the air above it is cooled, evaporation is checked, less moisture is conveyed inland by the westerly and southwesterly winds, and a diminution in the rainfall over the neighboring coast results. If the temperature of the water is sufficiently lowered, drought conditions should prevail over the land.

Under normal conditions the Japan Current crosses the north Pacific about 400 miles to the south of the Aleutian Archipelago. The air overlying the current becomes heated and rises, causing a surface inflow of air from the north and south. The Aleutian Islands, lying to the north of the current, are chilled by the cold air flowing from the former direction. In the event of a shifting of the current toward the north, the Aleutian group comes directly under the influence of the warm air overlying the current and experiences abnormally high temperatures. Abnormally high Aleutian temperatures should, therefore, presage drought conditions over our Pacific coast, while low Aleutian temperatures should be followed by abundant rainfall.

The only meteorological records originally employed to substantiate the foregoing hypothesis are a four years' record from Unga Island and an old Russian temperature record at Unalaska from 1828 to 1834. The first-named record seems to indicate that high temperatures during the fall and early winter are followed three months later by drought in California; the Russian record shows that abnormally high temperatures prevailed at Unalaska during 1828, while, as far as can be determined, the California wheat crop was almost a complete failure in the spring of 1829. Taken together, the rainfall records for California and the temperature records obtained at Unga Island point toward a three months interval between the occurrence of abnormal heat at Unga and abnormal dryness throughout California. Hydrographic Office charts showing the velocity of the ocean current at various points in its course indicate that about three months are consumed by it in flowing from Unga to the California coast. It is thought, therefore, that if temperature and wind direction records from stations established in the Aleutian Islands could be received in time along the California coast a long-range forecast of temperature and precipitation could be issued for the latter district.

So much for the theory. The question at issue, then, is whether the Japan Current, or more correctly the North Pacific Ocean Current, actually controls the weather of the Pacific coast in the manner stated; i. e., whether drought occurs in California three months after abnormally high Aleutian temperatures.

In the interest of navigation the causes and effects of ocean currents are being constantly studied by the hydrographers of all nations; but as the currents have been plotted almost entirely with a view to determine their influence upon a vessel's course, their direction and rapidity of flow, rather than their temperature, have been considered. However, the latter feature has received some attention. In the case of the Japan Current (and its extensions, so far as it is possible to trace them), it is noted that a steady decrease both in temperature and velocity is manifested as it progresses, so that the ocean drift, when it finally reaches the California coast, is not only colder than the corresponding latitude calls for, but is also extremely indefinite both as to width and direction. This dwindling away of the original Japan Current is certainly inimical to the theory that its sluggish temperature changes primarily influence the rainfall over so extensive an area as the Pacific slope. A similar and erroneous idea that the Gulf Stream determines the climate of all western Europe has at length been abandoned by hydrographers and meteorologists, who now agree that geographical position and the general eastward drift of the atmosphere are the determining influences affecting climate and that the Gulf Stream is not recognizable as such beyond Nova Scotia.

If the temperature of the ocean water controls the rainfall over the California coast, then, inasmuch as the water temperatures off the northern coast of California are nearly the same as those off the southern coast, it must follow that the rainfall along the entire margin of the State should be quite uniform, a conclusion that is negatived by the fact that drought conditions in the south quite often coexist with normal rainfall conditions to the northward. In reality the more abundant rainfall of the north Pacific coast, as contrasted with that of the south Pacific, must be accounted for by the fact that while three influences (a neighboring ocean, proximity to the usual track of cyclonic areas, and mountain barriers extending at right angles to the rain-producing winds) operate in the former locality, a single influence, the neighboring ocean, alone dominates farther south.

TABLE 1.—*Monthly mean temperatures, at Unalaska Island, latitude* 54° *N; longitude* 167 *W.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
1883	.....	.....	.....	30.7	38.0	43.5	48.1	47.8	44.5	42.5	36.1	30.4
1884	33.1	36.0	32.5	34.4	36.8	42.7	48.8	48.8	46.1	39.7	36.5	35.1
1885	36.8	27.0	30.5	35.0	39.4	42.9	46.7	48.5	44.1	41.3	35.4	33.8
1886	33.7	27.5	31.6	34.8	40.0	.....	.....	.....	.....	.....	.....	.....
Sums	103.6	90.5	94.6	134.9	154.2	129.1	143.6	145.1	134.7	123.5	108.0	99.3
Means	34.5	30.2	31.5	33.7	38.6	43.0	47.9	48.4	44.9	41.2	36.0	33.1

In order that the theory may be fairly tested a continuous temperature record from some station located on one of the Aleutian Islands is required, and although an effort has been made to collect the reports of all meteorological observations taken throughout this portion of the globe, thus far only fragmentary records have been secured. One of the best of these, a continuous temperature record for Unalaska embracing the unbroken period from April, 1883, to May, 1886, inclusive, has been employed by me. The preceding table shows the monthly average temperatures at Unalaska during this period.

While the means shown above can not be considered as representing the actual normal temperature conditions at Unalaska for the several months of the year, for want of more accurate data they will be employed as normals in the comparisons which follow. Table 2 shows the departure from normal for each month of the record.

TABLE 2.—*Departures of monthly mean temperatures from average (normal) monthly temperatures at Unalaska.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
1883	.....	.....	.....	−3.0	−0.6	+0.5	+0.2	−0.6	−0.4	+1.3	+0.1	−2.7
1884	−1.4	+5.8	+1.0	+0.7	−1.8	−0.3	+0.9	+0.4	+1.2	−1.5	+0.5	+2.0
1885	+2.3	−3.2	−1.0	+1.3	+0.8	−0.1	−1.2	+0.1	−0.8	+0.1	−0.6	+0.7
1886	−0.8	−2.7	+0.1	+1.1	+1.4	.....	.....	.....	.....	.....	.....	.....

The rainfall records from five stations in California, Red Bluff, Sacramento, San Francisco, Los Angeles, and San Diego, are next considered, these stations are selected because of geographical position and length of record, as affecting accuracy of monthly normals. For each month tabulated averages of the aggregate actual rainfall, and of the aggregate normal rainfall for the five stations are compared for the purpose of deducing an average departure from the average normal rainfall. The result is shown in Table 3.

TABLE 3.—*Combined records of total monthly precipitation at Red Bluff, Sacramento, San Francisco, Los Angeles, and San Diego, Cal.*

		January.	February.	March.	April.	May.	June.
		Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Average normal precipitation		3.64	3.21	2.76	1.71	0.77	0.21
1883	Average actual precipitation	.....	.....	.....	.....	.....	.....
	Average departure from normal.	.....	.....	.....	.....	.....	.....
1884	Average actual precipitation	3.08	7.15	8.56	4.28	0.61	1.34
	Average departure from normal.	−0.56	+3.94	+5.80	+2.57	−0.16	+1.13
1885	Average actual precipitation	1.59	0.40	0.38	1.54	0.27	.....
	Average departure from normal.	−2.05	−2.81	−2.38	−0.17	−0.50	.....
1886	Average actual precipitation	6.99	0.73	2.46	3.75	0.24	0.04
	Average departure from normal.	+3.35	−2.48	−0.30	+2.04	−0.53	−0.17

		July.	August.	September.	October.	November.	December.
		Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Average normal precipitation		0.02	0.04	0.29	0.92	2.02	4.12
1883	Average actual precipitation	T.	T.	0.47	1.71	0.63	1.26
	Average departure from normal.	−0.02	−0.04	+0.18	+0.79	−1.39	−2.86
1884	Average actual precipitation	T.	0.01	0.28	1.24	0.30	7.13
	Average departure from normal.	−0.02	−0.03	−0.01	+0.32	−1.72	+3.01
1885	Average actual precipitation	0.02	0.03	0.63	0.29	9.46	3.39
	Average departure from normal.	0.00	−0.01	+0.34	−0.63	+7.44	−0.73
1886	Average actual precipitation	0.10	0.04	.....	0.80	0.70	1.71
	Average departure from normal.	+0.08	0.00	.....	−0.12	−1.32	−2.41

If any intimate relation exists between Aleutian temperatures and California rainfall, it may now be shown by parallel tabulation of the average monthly departures from normal of the California rainfall (Table 3) and the departures of Aleutian monthly mean temperatures from the corresponding monthly normal temperatures (Table 2). In this tabulation (Table 4) the temperature departure for each month is placed alongside of the rainfall departure three months later, the shift being made in accordance with the hypothesis that the relation is manifested after the lapse of a three months' interval of time consumed by the Japan Current in flowing southward from the Aleutian Islands to the California coast. Only the months of the rainy season in the latter locality need be considered.

TABLE 4.—*Departures from normal.*

Year.	Month.	Aleutian temperatures.	California rainfall.	Month.	Year.
		° *F.*	*Inches.*		
1883	June	+0.5	+0.18	Sept.	1883
1883	July	+0.2	+0.79	Oct.	1883
1883	Aug.	−0.6	−1.39	Nov.	1883
1883	Sept.	−0.4	−2.86	Dec.	1883
1883	Oct.	+1.3	−0.56	Jan.	1884
1883	Nov.	+0.1	+3.94	Feb.	1884
1883	Dec.	−2.7	+5.80	Mar.	1884
1884	Jan.	−1.4	+2.57	April	1884
1884	Feb.	+5.8	−0.16	May	1884
1884	June	−0.3	−0.01	Sept.	1884
1884	July	+0.9	+0.32	Oct.	1884
1884	Aug.	+0.4	−1.72	Nov.	1884
1884	Sept.	+1.2	+3.01	Dec.	1884
1884	Oct.	−1.5	−2.05	Jan.	1885
1884	Nov.	+0.5	−2.81	Feb.	1885
1884	Dec.	+2.0	−2.38	Mar.	1885
1885	Jan.	+2.3	−0.17	April	1885
1885	Feb.	−3.2	−0.50	May	1885
1885	June	−0.1	+0.34	Sept.	1885
1885	July	−1.2	−0.63	Oct.	1885
1885	Aug.	+0.1	+7.44	Nov.	1885
1885	Sept.	−0.8	−0.73	Dec.	1885
1885	Oct.	+0.1	+3.35	Jan.	1886
1885	Nov.	−0.6	−2.48	Feb.	1886
1885	Dec.	+0.7	−0.30	Mar.	1886
1886	Jan.	−0.8	+2.04	April	1886
1886	Feb.	−2.7	−0.53	May	1886

From the foregoing table it will be seen at a glance that the supposed relation between Aleutian temperatures and California rainfall does not exist. If the theory advanced were correct, temperatures above the normal should accompany rainfalls correspondingly below, while temperatures below should indicate rainfall above the normal. Out of the 27 months considered, only 11 show even an approximate agreement with the theory, and in not more than six of these instances can the variation in the temperature be considered as commensurate with that of the rainfall. Furthermore, in the rainy season of 1885–86, it is to be noted that while the Aleutian temperatures remained within a single degree of the normal, the rainfall variation from month to month in California was extreme, ranging from 7.44 inches above to 2.48 inches below the normal. To formulate a long-range seasonal forecast of rainfall over California, based upon variations in Aleutian temperature, would therefore seem to be impossible.

It may be suggested that the evidence of only five rainfall records from California stations is not sufficient in itself to defeat the theory, but it can be shown that the same disagreement between hypothesis and fact exists when all the rainfall records throughout the State are introduced. In Table 5 the Aleutian temperature departures as found in Table 4 are compared with the average rainfall departures from normal for the entire State of California, the latter data being arranged to show the departure from normal in the northern and the southern sections, respectively. In this test the rainfall normals employed are computed only up to the year and month compared; they are those that were used during the respective months by the climate and crop section and were recomputed annually by including the new month of the current year.

Such a striking similarity exists between the rainfall departures in Table 4 and those shown in Table 5 that the conclusions drawn from the former are applicable, with equal force, to the latter. In five months of the record given in Table 5, rainfall above the normal in one-half of the State is coincident with rainfall below the normal in the other, an

additional argument (already touched upon) adverse to the hypothesis.

TABLE 5.—*Departure from normal.*

Year.	Month.	Aleutian temperatures.	California rainfall.		Month.	Year.
			Northern.	Southern.		
		° F.	*Inches.*	*Inches.*		
1883	June	+0.5	+ 0.37	+0.01	Sept.	1883
1883	July	+0.2	+ 0.60	+0.83	Oct.	1883
1883	Aug.	−0.6	− 1.37	−1.03	Nov.	1883
1883	Sept.	−0.4	− 2.53	−0.35	Dec	1883
1883	Oct.	+1.3	− 1.58	−0.74	Jan.	1884
1883	Nov.	+0.1	+ 0.31	+5.42	Feb.	1884
1883	Dec	−2.7	+ 5.08	+5.85	Mar.	1884
1884	Jan.	−1.4	+ 2.19	+1.12	April	1884
1884	Feb.	+5.8	− 0.85	+0.71	May	1884
1884	June	−0.3	+ 0.12	−0.05	Sept.	1884
1884	July.	+0.9	+ 0.64	−0.21	Oct.	1884
1884	Aug.	+0.4	− 2.08	−0.17	Nov.	1884
1884	Sept.	+1.2	+ 4.35	+1.80	Dec.	1884
1884	Oct.	−1.5	− 2.84	−1.00	Jan.	1885
1884	Nov.	+0.5	− 3.49	−2.44	Feb.	1885
1884	Dec.	+2.0	− 3.18	−1.42	Mar.	1885
1885	Jan.	+2.3	− 1.51	+0.11	April	1885
1885	Feb.	−3.2	− 0.60	−0.13	May	1885
1885	June	−0.1	+ 0.73	0.00	Sept.	1885
1885	July	−1.2	− 0.62	−0.20	Oct.	1885
1885	Aug.	+0.1	+10.06	+2.39	Nov.	1885
1885	Sept.	−0.8	+ 0.09	−1.37	Dec.	1885
1885	Oct.	+0.1	+ 2.17	+3.20	Jan.	1886
1885	Nov.	−0.6	− 2.83	−1.26	Feb.	1886
1885	Dec.	+0.7	− 0.82	+0.67	Mar.	1886
1886	Jan.	−0.8	+ 1.70	+0.87	April	1886
1886	Feb.	−2.7	− 0.43	−0.31	May	1886

Regarded as a whole, the Japan Current theory is open to the objection that the generalization is out of all proportion to the premises. The conclusion arrived at is far too weighty to be suspended upon so slender a thread of evidence as that presented by the Unga Island records. A coincidence has been discovered, not a law. Variations in the path of the Japan Current have little, if any, effect upon the rainfall either in California or elsewhere along our Pacific coast. The distribution of atmospheric pressure is undoubtedly the determining factor, for, upon investigation, it is found that if, from any cause, the mean storm track shifts to the southward along the western margin of the United States, such shifting is accompanied by heavy precipitation in regions where, under ordinary conditions, the rainfall is but scanty in amount. Such a condition prevailed in December, 1889, when the storm track shifted southward from the extreme northwestern border to central California. During this month the rainfall over the California coast was heavier than that over any other portion of the Pacific slope. Such shifts of storms and winds are the ultimate causes of changes in the ocean currents or drift and in the weather or climate; the Japan Current and ocean drift have no effective influence on California weather.

Inasmuch as storm areas must appear upon the weather map before their probable courses can be determined, and since individual storms cross the field of observation and disappear within a few days, we must consider long-range forecasting for any section of the country as impossible until our present knowledge of meteorology has been materially increased; until, in fact, the general circulation of the atmosphere is thoroughly understood.

SOME FEATURES OF THE CLIMATE OF IDAHO.[1]

By S. M. BLANDFORD, Section Director, dated Boise, Idaho, August 9, 1899.

An interesting study from a meteorological standpoint is found in the investigation of the physical laws which operate to give the isotherms of Idaho their north and south trend for a distance of 400 miles. A glance at the monthly isotherm chart, assisted by the knowledge that there are only slight variations from the general direction from month to month, suffices to show that the subject is worthy of investigation.

Few States in the Union possess more interesting features meteorologically and topographically than Idaho. Since these considerations become a part of each deduction which a forecaster is required to make in diagnosing the weather symptoms of any locality, it will be interesting to note to what extent they are intertwined in Idaho.

Preliminary to the discussion of the cause of the peculiar trend of the isotherms, it will be interesting to note the varying elevations over an undulating surface, such as the State presents, from its 485 miles of western boundary, eastward to its natural boundary, the Bitter Root Range and Rocky Mountains, i. e., from a point where the normal actual barometric pressure is 29 inches, corresponding to 1,000 feet elevation, to 22 inches pressure (8,000 feet) at its eastern boundary, the Rocky Mountains.

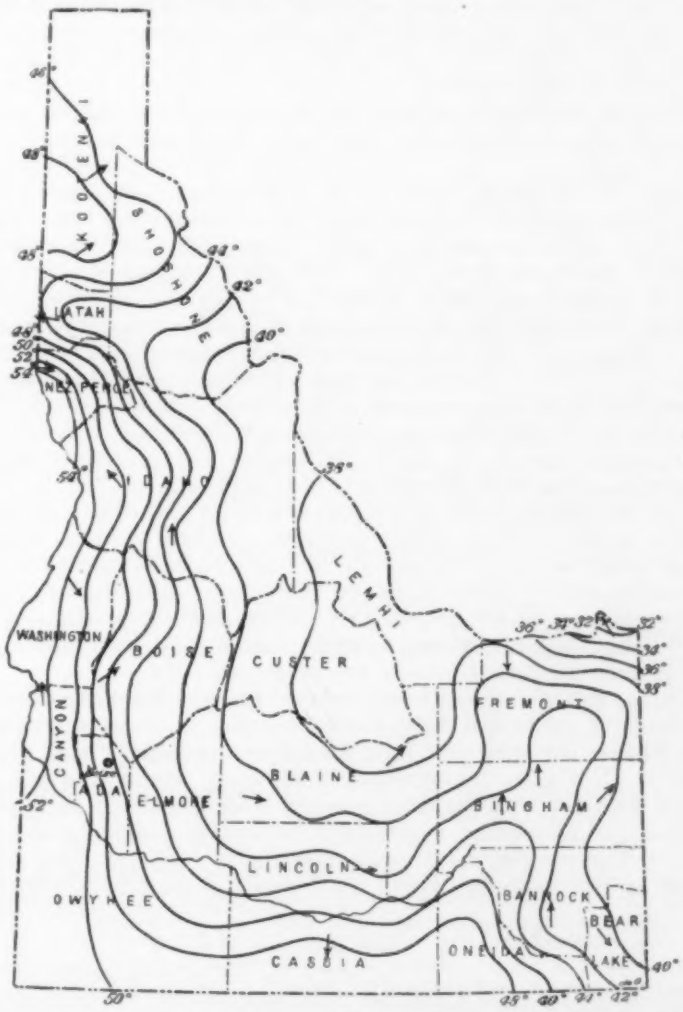


FIG. 2.—Mean annual isotherms and prevailing winds in Idaho, 1898.

An 8,000-foot barrier, trending southeastward from the winter storm track and penetrating the numerous cyclonic disturbances to a vertical height of a mile and a half, necessarily has an influence sufficient to cause the forecaster serious reflection in determining to what extent the storms are deflected by it from their natural course.

Not the least consideration is the valley of the Snake River,

[1] In reply to a general circular letter of September 14, 1898, Mr. S. M. Blandford, Section Director at Boise, Idaho, prepared a report on some features of the climate of Idaho that has not, so far as we know, as yet been published and which we take pleasure in laying before our readers. In connection with this article, a previous one on weather types, published at Portland, Oreg., in pamphlet form, August 15, 1897, should be studied.—ED.

which, from a topographical view, is a trough in the great American Plateau. For 400 miles eastward from its intersection with the western boundary of the State, the surface of this valley ranges from 1,000 to 4,000 feet above sea level, while the mountains that surround it on the north, east, south, and west vary in height from 6,000 to 10,000 feet. Briefly, these are the prominent topographical characteristics of the State of Idaho that bear upon our subject.

It is not generally known that the Snake River Valley, covering one-third of the State, has a climate so mild in the winter season as to be the natural home for stock from the first fall of heavy snow on the mountains until signs of spring appear. In this favored valley thousands of sheep, horses, and cattle seek refuge from the storms and cold waves of winter. Not only does the mildness of the temperature offer inducement to the herder to establish his winter quarters here, but the almost total absence of snow and the presence of growing grass enable the stock to subsist during mild winters upon what nature alone has provided.

Why should the Snake River Valley be mild when to the southward, over the plateau States, the normal condition during the winter season is an area of high pressure prevailing for weeks without great fluctuation? There is no explanation for it unless the air when flowing over the mountains from the high pressure area down into the Snake River Valley is heated by compression.

During the winter season storms pass in succession over the Canadian Northwest bringing Idaho continually within the field of influence, though the center of disturbance almost invariably remains in the north. It is during the prevalence of the storms in the north that Idaho remains in the foothills of the high pressure area prevailing over the plateau States with the barometer (reduced to sea-level) reading 30.40 to 30.80 at Idaho Falls, Salt Lake City, Denver, and Carson City, and moderately high at Baker City, varying, apparently, with the declivity of the depression in the north. The drift of the air from the high pressure area of the Plateau occurs with each appearance of a depression over Alberta, and as the air drifts over the network of mountains to the south and west of the Snake River Valley the principle of dynamic heating comes into operation.

When the high area disappears from the Plateau, permitting the troughs from the low pressure field to sweep southward through the State into Utah, Nevada, and Arizona, then the cold weather occurs in Idaho, since the slightest depression passing southward through the State is productive of a fall in temperature and is sufficient to justify the issuance of frost warnings as late in the season as July.

Since the Weather Bureau established the station at Boise persistent effort has been made to induce those to whom the daily weather map is accessible to comprehend these plain rules. Not until February 2, 1899, when Idaho was visited by a cold wave of unusual severity which resulted in loss of stock, did those who were vitally interested comprehend that their loss would have been materially lessened had they heeded the warnings which gave time for ample protection.

STUDIES ON THE ATMOSPHERE AT TRAPPES, FRANCE.[1]

By M. LEON TEISSERENC DE BORT.

Since the autumn of 1897 more than a hundred and fifty kite ascensions have been made at the Trappes Observatory, although the atmospheric conditions are less favorable than those on the American coast.

[1] Translated from the Journal de Physique, (3) Vol. IX, March, 1900, pp. 133–137.

These observations demonstrate the importance of inversions of temperature in the vertical, as soon as the cyclonic condition has ceased to exist; a decrease of temperature, very slight in the first 1,200 meters, is an almost certain indication of fine weather the next day.

As with the Americans so with us—our ascensions have increased in height as our materials have improved, and we have learned better how to start the kites.

The vicinity of several lines of railroad, and of quite a crowded network of telegraph wires prevented us in many cases from letting out long lines of kite wire, the slightest accident causing our line to be carried down to the railroad track. Nevertheless, the very first year we attained an elevation of 2,000 meters, then 2,500, and 3,850 meters. Finally, September last, we were able to raise our instruments as high as 4,300 meters.

Whatever be the success obtained by the kite the altitudes reached are necessarily limited. Moreover, they can not ascend at all in calm weather; we must, therefore, have recourse to balloons in order to explore the atmosphere more thoroughly. The ascensions of the "Aérophiles" of Messrs. Hermite and Bésancon showed:

(1) That the temperature was much lower than was supposed from the observations made on mountains, since a temperature of —60° was found at an altitude below 14,000 meters.

(2) That the gas inside of the balloon cooled very rapidly, so as to approach the theoretical temperature obtained by the expansion of the gas for the same differences of pressure. This fact, which has been neglected up to the present time, because it is generally concealed by the great rise of temperature produced when the balloon is exposed to the sun, is of considerable practical importance, and must be taken into account in calculating the height that can be reached by a balloon ascending in the night.

(3) These ascensions have led M. Hermite to construct a form of shelter called "parasoliel," for sheltering the instruments from solar radiation. This "parasoleil" consists of a paper tube blackened on the inside, and covered on the outside with a sheet of metal in such a way as to become heated to the least possible degree under the direct action of the sun.

Since the meteorological conference at Paris in 1896, an international agreement has been entered into, and at certain fixed times, sounding balloons have been sent up from Paris, Berlin, Strasburg, Vienna, Munich, and St. Petersburg. These ascensions, six in number, are not as yet sufficiently numerous to lead to the discovery of very precise laws, but have enabled us to study the methods and to explain many details.

In view of the diversity in the atmospheric conditions and of the rapidity with which the phenomena change from day to day, I have thought it necessary to make very frequent aerial soundings—when necessary, several times a week—and for this purpose we have first turned our attention to rendering the usage of sounding balloons more simple and less expensive.

We have attained this result by employing pure hydrogen, which allows of greatly diminishing the diameter of the balloons and of diminishing the weight of the instruments sent up, without, however, impairing their accuracy.

In order to send up these balloons even in violent winds or stormy weather, which has scarcely ever been attempted, but is of the greatest interest, I sought a device which would enable us to start the balloon, when once it is inflated, without exposing it to injury from the very first gusts, since we desire always to use extra light netting. For this purpose I adopted the following arrangement: I constructed, upon a revolving table, a very light tent, open on one side. The balloon once

inflated in this tent, care is taken to keep the opening turned away from the wind. The instruments are attached to the balloon, as is also a "ballast heaver," filled with sand or some liquid and provided with an aperture arranged in such a manner that it can empty itself in the proper interval, generally in about forty minutes. The balloon is then brought to the door of the tent; the ballast heaver is supported so as to facilitate the rising of the balloon a little, and the whole is then launched into the air with the least possible shake. Thanks to this device, we have been able to send up sounding balloons during storms in which the wind reached a velocity of 14 meters per second.

To avoid the disturbing influence of the rays of the sun and, above all, the radiation of the upper clouds when they are in great masses and form that sea of dazzling clouds so well known to alpine travelers and aeronauts, we have made the greater number of our night ascensions at first by moonlight—with a great deal of trouble, I must confess—and afterwards, when I succeeded in improving our apparatus, by electric light. Since the month of March, 1899, we have sent up more than a hundred and twenty balloons which have brought back curves of pressure and temperature. The height of 13,000 meters has been attained twenty-four times; 14,000 meters, eight times; 15,000 meters, three times.

We can with our present outfit reach a height of 13,000 meters nearly every time.

Confining the discussion of the observations collected to the atmosphere up to a height of 10,000 meters, the region explored by the greater number of the balloons, we see:

1. That the differences of temperature from one day to another may be greater at 7,000 or 8,000 meters than those observed the same day near the ground. This fact is of considerable importance and is besides contrary to the ideas we had previously formed on the subject.

2. We see that the temperature diminishes much faster near the centers of depression than elsewhere. This diminution reaches in certain cases about 0.90° C. per 100 meters.

Finally, it is remarked that in a great many areas of high pressure—I do not say in all—the decrease of temperature takes place in the following manner: from the ground to 1,500 or 2,000 meters the temperature varies little and sometimes even increases, after which it begins to diminish in a normal manner, and finishes by reaching at 9,000 or 10,000 meters a decrease of 1° per 100 meters. If we compare these values with those observed in the low areas we see that the variation in the vertical shows ordinarily the following characteristics:

The lower strata are often warmer in the areas of low pressure than in the areas of high pressure; but above several hundred meters of altitude the rapid diminution of temperature produces lower temperatures in the low areas.

Thus, the center of a depression at about 3,000 or 4,000 meters altitude is ordinarily colder than the corresponding part of the barometric maximum. This fact had already been demonstrated by Hann in his mountain observations; but the sounding balloons, while confirming this first result, show that higher up the temperatures have again a tendency to equalize themselves, and this is of great importance relative to the form of the upper isobars.

I would like to be able to say a few words about the temperature of the highest atmosphere, that which extends above the ordinary region of the cirrus clouds; but notwithstanding that we have observations at these altitudes, we shall have to wait to discuss them until we are certain that the thermometer—when the air is so greatly rarefied—is able, by simple contact, to come into thermal equilibrium with its surroundings. If it cannot, then we shall have to make use of special methods for determining the temperature at high altitudes.

MONTHLY STATEMENT OF AVERAGE WEATHER CONDITIONS FOR JANUARY.

By Prof. E. B. GARRIOTT.

The following statements are based on average weather conditions for January, as determined by long series of observations. As the weather of any given January does not conform strictly to the average conditions the statements can not be considered as forecasts:

January is a month of severe storms in the middle latitudes of the North Atlantic Ocean. Along the transatlantic steamship tracks these storms set in with southeast gales which shift to west and northwest with freezing temperature. Westward bound vessels experience sudden shifts of wind from the southeast and storms of comparatively short duration, and have prevailing strong head (westerly) winds. Storms encountered by eastward bound vessels are fewer in number and of longer duration; the vessels and the storms travel in the same direction. Storms seldom appear in the tropical regions of the Atlantic and Pacific oceans in January. On the north coast of western Cuba, however, and in the Gulf of Mexico, high and cold north winds are not uncommon during the winter months.

In the Lake region and the Atlantic coast districts of the United States the severest January storms come from the middle-West and Southwest, with northeast shifting to northwest gales; snow occurs on the north and rain or light snow on the south of the paths of the storms. In the Pacific coast States the rainy season is at its height, and strong gales occur from the central California coast to Alaska. In the Plateau and Rocky Mountain districts and on the great Plains the prevailing weather is fine and cold. This entire region is, however, subject to occasional cold waves of great severity, which, with snow and high winds, sweep southward to New Mexico and Texas and sometimes to the Rio Grande and northern Mexico, causing great losses of stock on the great ranges.

Frost is likely to occur in any part of the United States in January, and about once in five years severe freezes occur in the Gulf coast districts and in central and northern Florida.

CLIMATOLOGY OF COSTA RICA.

Communicated by H. PITTIER, Director, Physical Geographic Institute.

In communicating this abstract of the meteorological observations made in Costa Rica during January, 1901, and under date of February 20, Mr. Pittier says:

As far as the southwestern slope of this country is concerned, I do not think that agriculture is very much affected by any of our usual meteorological phenomena. As we have only one complete station, it would not be possible to construct charts of isobars, isotherms, and isohyets of Costa Rica. But I shall endeavor to establish a storm service so that we will be informed by telegraph of any storm occurring on the northeastern slope. Next week I go to Limon to establish a station there, the outfit of which will include a mercurial barometer, a registering aneroid, dry and wet bulb thermometers, Richard's dry and wet bulb registering thermometers, maximum and minimum thermometers, and the old rain gage. I have brought, also, a special outfit for the United Fruit Company, which I am going to put up at their farms at Zent. It includes one psychrometer, one maximum and one minimum thermometer, one pair maximum actinometers, one Jordan's sunshine recorder, and three earth thermometers. Mr. John Meiggs Keith, the General Manager of the Costa Rica division of the United Fruit Company, promises me to complete the outfit of instruments if we can obtain a good and permanent observer. As no white man can withstand indefinitely the mortiferous climate of Zent, I will try to get a young Jamaican negro, and bring him here for a few weeks, to be well instructed in the management of instruments, and then send him down.

TABLE I.—*Hourly observations at the Observatory, San Jose de Costa Rica, during January*, 1901.

Hours.	Pressure.		Temperature.		Relative humidity.		Rainfall.		
	Observed, 1901.	Normal, 1889-1900.	Observed, 1901.	Normal, 1889-1900.	Observed, 1901.	Normal, 1889-1900.	Observed, 1901.	Normal, 1889-1900.	During 1901.
	660+ mm.	660+ mm.	° C.	° C.	%	%	Mm.	Mm.	Hrs.
1 a. m	4.47	3.71	16.25	16.25	80	85	0.9	0.1	1.00
2 a. m	2.95	3.55	16.21	16.04	82	85	0.4	0.0	0.83
3 a. m	3.68	3.14	16.15	15.84	82	86	0.0	0.1	0.00
4 a. m	3.65	3.19	16.00	15.71	83	86	0.0	0.2	0.00
5 a. m	3.83	3.41	15.95	15.56	84	86	0.0	0.3	0.00
6 a. m	4.06	3.71	15.84	15.50	86	83	0.0	0.2	0.00
7 a. m	4.53	4.14	16.63	15.89	80	83	0.0	0.4	0.00
8 a. m	4.91	4.52	18.29	18.24	71	76	0.0	0.3	0.00
9 a. m	5.20	4.73	20.45	20.20	63	70	0.2	0.4	0.08
10 a. m	5.20	4.67	22.18	22.02	61	65	0.0	0.0	0.00
11 a. m	4.95	4.34	23.32	22.95	59	63	0.0	0.0	0.00
12 a. m	4.53	3.85	24.08	23.49	58	61	0.0	0.1	0.00
1 p. m	3.71	3.24	24.42	23.86	55	61	0.0	0.3	0.00
2 p. m	3.17	2.71	24.27	23.59	58	63	0.1	0.2	0.50
3 p. m	2.99	2.46	23.46	22.95	61	65	0.1	0.5	0.31
4 p. m	3.07	2.48	22.48	21.82	64	67	0.0	2.0	0.00
5 p. m	3.34	2.68	20.50	20.31	70	73	0.3	2.9	1.00
6 p. m	3.73	2.99	19.13	18.92	75	77	0.6	0.9	1.00
7 p. m	4.19	3.53	18.38	18.08	77	81	0.3	0.1	1.00
8 p. m	4.79	3.95	18.01	17.73	77	82	0.4	1.2	1.00
9 p. m	5.21	4.26	17.61	17.37	77	83	0.3	0.1	1.00
10 p. m	5.39	4.45	17.31	16.98	77	84	0.0	0.6	1.00
11 p. m	5.25	4.30	16.95	16.71	78	85	0.1	0.4	1.00
12 p. m	5.01	4.08	16.58	16.45	80	85	0.2	0.1	1.00
Mean	661.29	663.66	19.19	18.88	73	77	.....	.....	.....
Minimum	661.3	660.04	10.7	9.8	.....	.....	.....	.....	.....
Maximum	667.0	668.12	31.2	30.3	.....	.....	0.9	2.9	.....
Total	.....	.....	.....	.....	.....	.....	3.9	11.8	10.74

REMARKS.—The barometer is 1,169 meters above sea level. Readings are corrected for gravity, temperature, and instrumental error. The dry and wet bulb thermometers are 1.5 meters above ground and corrected for instrumental errors. The hourly readings for pressure, wet and dry bulb thermometers are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The hourly rainfall is as given by Hottinger's self-register, checked once a day.

TABLE 2.

Time.	Sunshine.		Cloudiness	Temperature of the soil at depth of—				
	Observed, 1901.	Normal, 1889-1900.	Observed, 1901.	0.15 m.	0.30 m.	0.60 m.	1.20 m.	3.00 m.
	Hours.	Hours.	Per cent.	° C.	° C.	° C.	° C.	° C.
7 a. m	4.46	8.28	34	19.45	19.82	20.05	20.25	20.87
8 a. m	22.58	22.43						
9 a. m	22.48	22.55						
10 a. m	19.51	20.73	42	19.71	19.87	20.07	20.28	.....
11 a. m	18.50	19.74						
12 m	17.47	18.42						
1 p. m	18.00	17.99	45	20.38	20.05	20.07	20.31	.....
2 p. m	19.32	19.74						
3 p. m	17.91	19.23						
4 p. m	19.05	17.44	54	20.00	19.57	20.12	20.32	.....
5 p. m	15.48	19.70						
6 p. m	2.70	2.54						
7 p. m	.....	.....	34	20.48	20.22	20.03	20.26	.....
8 p. m	.....	.....						
9 p. m	.....	.....						
10 p. m	.....	.....	29	19.97	19.93	19.97	20.20	.....
11 p. m	.....	.....						
12 p. m	.....	.....						
Mean	.....	.....	40	20.00	19.61	20.05	20.27	20.87
Total	197.55	201.79	.....	.....	.....	.....	.....	.....

Notes on the weather.—January 18–19, stormy days with strong east wind, high barometer and rain in San Jose; violent rainfall on the Atlantic slope with inundations and damage to the railroad.

Notes on earthquakes.—January 1, 6:57 and 7 p. m., two slight undulatory tremors from northwest to southeast; intensity, 4; duration, 5 seconds. January 7, 4:41 a. m., one slight undulatory movement, east-northeast to west-southwest, intensity 2, duration 3 seconds—6:27 p. m.; slight tremor north-northwest, intensity 4, duration 8 seconds—11 p. m., very slight trepidatory movement, intensity 1, duration 2 seconds.

TABLE 3.—*Rainfall at stations in Costa Rica during Janury*, 1901.

Stations.	Amount.	Days.	Stations.	Amount.	Days.
	Mm.			Mm.	
1. Boca Banano	265	17	13. Juan Vinas	159	14
2. Limon	304	19	14. Santiago‡	.....	.....
3. Swamp Mouth*	.....	.....	15. Paraiso‡	.....	.....
4. Zent‡	.....	.....	16. San Rafael C†	.....	.....
5. Gute Hoffnung	411	15	17. Tres Rios	2	1
6. Siquirres	406	10	18. La Palma†	.....	.....
7. Guapiles†	.....	.....	19. San Francisco G	7	2
8. Sarapiqui†	.....	.....	20. San Jose	4	2
9. San Carlos	301	19	21. La Verbena†	.....	.....
10. Las Lomas	521	16	22. Alajuela†	.....	.....
11. Peralta†	.....	.....	23. Nuestro Amo†	.....	.....
12. Turrialba‡	.....	.....			

*Observations not complete. †Observations not received. ‡Observations to begin March 1.

RELATION OF THE WATER LEVEL OF GREAT SALT LAKE TO THE PRECIPITATION.

By L. H. MURDOCH, Section Director, dated January 25, 1901.

On December 31, 1900, the water level of Great Salt Lake was 9 inches below the zero of the scale, measured on the gage at Garfield Beach. This gage was established many years ago by the United States Geological Survey and its zero placed at what was believed to be one foot below the lowest known water. Many old settlers claim, however, that the water was lower in 1848 than the point accepted by the officials of the United States Geological Survey as the lowest known level. In 1848 there was a dry bar extending from the mainland to Antelope Island. In September of 1900 this bar was again exposed, and since then it has been possible to drive or walk to the island dry shod. There can be but little doubt that the reading of minus 9 inches is the lowest water level reached since the settlement of the State.

The question naturally arises, what is the cause of this remarkable fall in the lake and will it continue to fall and finally disappear within a few years?

One explanation offered is that the fall is due to the diverting of large quantities of water from the streams flowing into the lake for irrigation purposes. With a view to ascertaining how far a shortage in precipitation is responsible for this decline in the lake level, all the precipitation data collected in the Great Salt Lake basin was tabulated and the averages calculated and compared. But it was seen that objection could be raised to any conclusions drawn from these averages for the reason that the average annual rainfall of the basin ranges from less than 5 inches in the driest parts to about 18 inches where the precipitation is heaviest, and as stations have been established here and discontinued there, it was seen that the data was not comparable. Nevertheless, the results of these calculations and comparisons show that the last fifteen years have been the driest on record.

The precipitation data for Salt Lake City, including that for Fort Douglas, are complete back to 1863, with the exception of the data for 1866. The data for Ogden and Corinne are complete back to and including 1871. These stations lie a few miles east of the lake, and the distance from Corinne on the north to Salt Lake City on the south is about 55 miles. The data for these stations were tabulated, averages obtained for each year, and the results charted.

The average annual precipitation for these three stations from 1863 to 1900, inclusive, is 14.65 inches. The last decline in the water level of the lake began in 1887. The average precipitation from 1863 to 1885, inclusive, is 15.32 inches, while the average from 1886 to 1900, inclusive (fifteen years), is only 13.67 inches, which is 0.98 inches below the average for all years and 1.65 inches below the average for the pre-

ceding twenty-three years. The year 1886 has been included with those following because it was a decline in the precipitation that year which caused the lake to fall the following year. Of course the average for the entire period gives the best normal, and, as the comparison of the average for the last fifteen years with this normal, shows an average shortage of 0.98 inch for each year, the total shortage for the fifteen years ending 1900 is 14.70 inches. With a shortage of 14.70 inches in rainfall a decided fall in the lake level would naturally be expected, and a fall of about 9 feet and 11 inches occurred. The fall was from a maximum of about 9 feet 2 inches in 1886 to a minimum of minus 9 inches at the close of 1900.

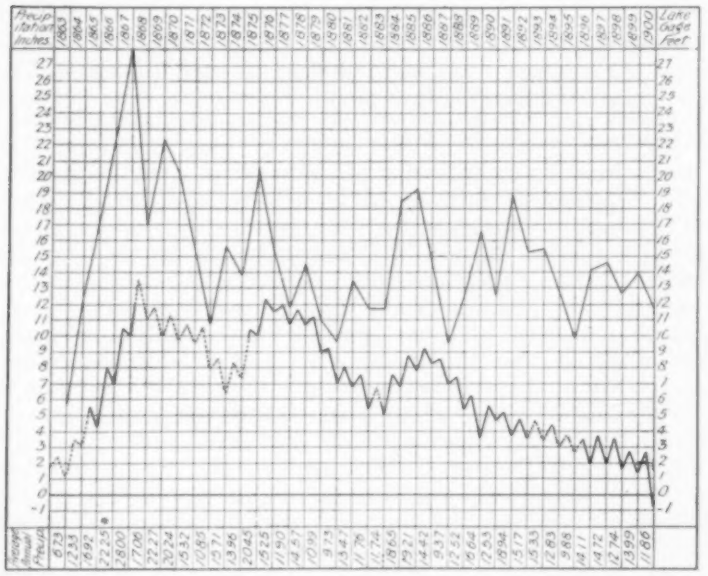


FIG. 2.—Chart showing average annual precipitation of Great Salt Lake basin as obtained from the records of three stations, Salt Lake City, Ogden, and Corinne, and fluctuations of water level of Great Salt Lake from 1863 to 1900.

The upper line indicates the precipitation and the lower one the lake level.

Dotted line indicates periods of no authentic observations or that the data have been approximated.

The lake level from 1863 to 1890 is from a diagram published by the Oregon Short Line Railroad Company, and based upon data furnished by Prof. Marcus E. Jones.

The average precipitation for the fifteen years preceding 1886, or from 1871 to 1885, inclusive, was 14.24 inches, which is 0.57 inch greater than the average for the fifteen years ending 1900, but 0.41 inch below the normal. The average for the eight years from 1863 to 1870, inclusive, approximating the precipitation of 1866 at 22.25 inches, is 18.22 inches, or 3.57 inches above the normal. The wettest fifteen consecutive years were those from 1864 to 1878, inclusive, with an average of 17.14 inches, and during this period the lake rose to a maximum height of about 13 feet 5 inches in 1868, fell to a minimum of about 6 feet in 1874, and reached a maximum height of about 12 feet 5 inches in 1876. The rise of 1868 was preceded by 28 inches of rainfall in 1867, and the rise of 1876 by 20.45 inches in 1875.

The question now arises, is the climate of the Great Salt Lake basin becoming drier?

The climate of the Great Salt Lake basin is not changing. The average precipitation for the next fifty years will agree very closely with the average for the past fifty years. Periods of heavy precipitation will occur again, and following them the lake will rise to about the same levels reached by it in the past.

* Approximated.

THE WATER LEVEL OF GREAT SALT LAKE.

By Mr. G. K. GILBERT, U. S Geological Survey, dated February 8, 1901.

The data Mr. Murdoch has brought together I find interesting, not only because they relate to a subject which occupied my attention some years ago, but because they give an unexpected attestation to the value of the ordinary record of precipitation. For various reasons it has been thought that the rain gage records but imperfectly the actual precipitation of the locality where it is placed, and also that the precipitation record at a single locality in an arid district represents very imperfectly the march, from year to year, of the average precipitation of the surrounding region. Mr. Murdoch's table compares a local precipitation record with the variations of a water surface so situated as to be greatly influenced by variations of the precipitation on a neighboring mountain range, and the accordance of the two records seems to me remarkably good.

Omitting the years for which the lake water record is interpolated, I find from the graphic table that there are twenty-three annual records susceptible of direct comparison with the rain-gage record. For each of these twenty-three years, I have compared the rain-gage record with the normal, noting the excess or defect of precipitation, and I have also compared the records of lake level for the beginning and end of the year, noting whether, and how much, the level has risen or fallen. The correspondence of excess of precipitation with the rise of the lake, and of defect of precipitation with the fall of the lake, is almost complete, there being but three years of the twenty-three in which a deviation of precipitation from the normal to the extent of one inch, is not accompanied by a change of lake level having the proper sign.

Finding the data thus accordant, I have thought it legitimate to carry the discussion a little further than Mr. Murdoch has done. He has shown that the recent great fall of the lake surface corresponds to a period of defective precipitation, but he has not attempted to show whether the change in precipitation is fully adequate to account for the lowering of the lake. Making use of his tables, and neglecting as before, the years for which the lake record is interpolated, I find that there were eight years in which the recorded precipitation exceeded the normal, the total excess amounting to 36.46 inches. In six of those eight years the lake rose 9.9 feet, and in other two it fell 2.8 feet, leaving a net rise of 7.1 feet. In fifteen years the rainfall was less than the normal, giving a total defect of 32.99 inches. In thirteen of those years the lake fell 12.4 feet, and in the other two rose 1.5 feet, leaving a net fall for the period of 10.9 feet. Summing these data, without regard to signs, we have a total of deviations of precipitation from the normal amounting to 69.45 inches, corresponding to a total of accordant changes in the level of the lake amounting to 18.0 feet. This gives 0.26 foot as the amount of lake change corresponding to one inch excess or defect of precipitation, and we may apply this factor to the period of defective rainfall mentioned by Mr. Murdoch. In the fifteen years, from 1886 to 1900, inclusive, the total shortage of rainfall is 14.70 inches, and this, according to the scale just determined, will account for 3.82 feet of fall in the lake. The actual fall was considerably greater, being 9.9 feet.

While this discussion is not fully satisfactory, and is open to the objection that the lake change per unit of precipitation is derived in part from some of the same observations to which it is afterwards applied, it may yet be accepted as indicating that shortage of rainfall does not suffice to account for the whole of the fall of the lake surface.

The problem is complex, and if a complete analysis were possible, it would probably serve to show that a number of factors have conspired to produce the observed shrinkage of the lake. I apprehend that a prominent place among these

factors would be accorded to irrigation, or the diversion to cultivated fields of waters which would otherwise flow unimpeded to the lake. I understand that the area of irrigated land within the drainage district of the lake has been greatly enlarged during the last decade, and I do not see how this could fail to influence that balance between inflow and evaporation which determines the height of the lake. The water spread upon the farm lands is in part evaporated directly, and in part transpired by plants, and both these parts are carried away by the air. A portion also finds its way into the ground, and eventually reaches the lake through springs. That which enters the air increases the local relative humidity, and doubtless increases precipitation on the great mountain range to the eastward, so that a portion of it is returned to the rivers, but as the period of principal evaporation and transpiration from the land does not correspond with the period of principal precipitation on the mountains, it is probable that the share of irrigation water thus prevented from escaping the drainage basin is not great. It certainly is not sufficient to prevent the work of irrigation from greatly diminishing the amount of water which the rivers discharge to the lake.

In the natural condition of the country, before the advent of the white man, the rise and fall of the lake was a climatic index responding to the conjoined influences of variations in temperature, precipitation, and wind. Had the gage record been then kept it would have constituted a valuable contribution to the history of climate. But the same immigration, which instituted observations of lake changes, also established various industries tending to modify the condition of the land and interfere with the reaction of natural agencies, and now that agriculture is striving to divert to its own purposes as much as possible of the normal tribute of the lake, the gage has practically lost its value as a register of climate. Much interest, both economic and scientific, still attaches to its readings, and part of that interest is meteorologic, but it has become practically impossible to discriminate between the consequences of natural and human influences.

FOG STUDIES ON MOUNT TAMALPAIS: NUMBER 3—PHOTOGRAPHS OF FOG BILLOWS.

By ALEXANDER G. MCADIE, Forecast Official.

In several papers presented to the Royal Academy of Sciences of Prussia Prof. H. von Helmholtz has discussed the conditions which must occur in the atmosphere where strata of different densities lie close together, with particular reference to the billow and wave effects near the limiting surfaces of the strata.

It appears to me not doubtful,[1] says Helmholtz, that such systems of waves occur with remarkable frequency at the bounding surfaces of strata of air of different densities, even although in most cases they remain invisible to us. Evidently we see them only when the lowest stratum is so nearly saturated with aqueous vapor that the summit of the wave, within which the pressure is less, begins to form a haze.

It is probable, as Helmholtz states, that conditions favorable for the origin and propagation of air waves often exist, but with the exception of certain cloud forms it is seldom that the meteorologist has an opportunity to see this wave action clearly defined. It therefore seems of importance to present a few photographs showing the actual wave effects produced probably by the sharp contrasts of air currents of different densities in the vicinity of Mount Tamalpais. In the preceding papers[2] the contour of the land and the character of the strong indraft of water vapor having a mean temperature of about 12° C., and which is suddenly injected into a mass of air having a mean temperature of about 24° C., have been described in detail.

It is thought that in the photographs of fog billows (Plates I and II) there is evidence of the movement of rectilinear waves propagated with little change of form and velocity along the bounding surfaces of the different air strata.

With a wind velocity of 10 meters per second, which nearly corresponds with the mean velocity of the inflowing colder current (the average summer afternoon velocity of the wind through the Golden Gate is about 22 miles per hour), the wave length, λ, is determined by von Helmholtz to be about 900 meters (2,950 feet). The wave lengths shown in the various fog photographs herewith are of corresponding magnitude and vary, it is estimated, from 100 to 2,000 meters. Helmholtz states further:[3]

Since the moderate winds that occur on the surface of the earth often cause water waves of a meter in length, therefore the same winds acting upon strata of air of 10 degrees difference in temperature maintain waves of from 2 to 5 kilometers in length.

Equations for the velocity of propagation and the diminution of the speed with a change of the depth of the lower stratum and a discussion of the energy of the waves are given for special cases. It is also pointed out that the elevations of the air waves can amount to many hundred meters, and that precipitation could thus be mechanically brought about. The same wind can excite waves of different lengths and velocities, and the interference and reinforcement may perceptibly modify the wave form. One of the processes by which waves of great height can be formed is thus pointed out by Helmholtz, namely, where two wave summits of different groups of waves reinforce each other. The wave height may be so great that foaming is produced. Such long and deep waves may have a bearing on the explanation of certain local and nonperiodic disturbances.

The demonstrated existence of these air billows and waves is important also in connection with the transmission of other air waves. It is well known that sound waves are reflected and refracted in a marked degree in the vicinity of fog banks, fog walls, and fog billows. The inaudibility of fog signals from sirens is one of the greatest sources of danger and anxiety in navigation. Any increase in our knowledge of the dispersion and aberration of these fog signals will be hailed with joy by many thousand travelers. In the vicinity of San Francisco, as evidenced by the series of photographs accompanying these papers, the opportunities for studying the general aberration of sound waves in fog are excellent. It is our earnest hope that in due time some experimental work in this direction may be undertaken at the observatory on Mt. Tamalpais. Some very strange effects have already been noticed with regard to the noise of a train when traversing different air strata.

Zones of audibility appear to be quite sharply marked, even after making allowance for the many canyons and "mesas" (tablelands). On foggy days these zones are greatly modified. In addition to changes in density and temperature which sound waves would experience, there are changes due to the movement of the sound conveying medium. The strong air currents moving toward the listener increase the frequency of vibration, and raise the pitch; conversely the air currents moving away from the listener flatten the note.

There have been several instances on nights without fog where ordinary sounds have been heard distinctly a distance of nearly two miles. On other occasions it has been possible to obtain echoes from hills distant one-half mile or more when the intervening valley was covered with fog. The echoes could not be heard when the fog was absent.

The accompanying photographs may throw light upon the

[1] See Abbe's Mechanics of the Earth's Atmosphere, p. 94.

[2] See MONTHLY WEATHER REVIEW, August, 1900, p. 283, and November, 1900, p. 492.

[3] See Mechanics of the Earth's Atmosphere, p. 103.

much-discussed question of the abnormal aberration of fog signals. It will be remembered that Prof. Joseph Henry, who for twelve years served as chairman of the Lighthouse Board, thought that the wind played a more important part in the abnormal aberration of sound waves than the so-called acoustic clouds described by Professor Tyndall. It is probable that up to a certain point both explanations may hold, but the wind is seemingly the more active factor in most cases. Sound moving with the wind is refracted downward, and moving against the wind refracted upward.[4]

From the great mass of conflicting evidence it appears that a homogeneous atmosphere without the internal stream lines (see reference to this under Air Drainage in previous papers[5]), conveys sound waves very well. But this is not the usual condition. Under normal conditions the mass of air within a mile or two of a lighthouse and extending upward half a mile is neither still nor homogeneous. One of the main purposes of the accompanying fog photographs is to show the stratification, faulting, and upheaval effects, due to differences of temperature and density caused by extensive and rapidly moving currents. Of course the aberration of audibility of fog signals due to changes of the sound-conveying medium is not to be confounded with the aberration in audibility due to topographical features and the normal reflection and refraction of sound waves. Probably within a short distance of every lighthouse there are zones or points of inaudibility due to the latter causes. An excellent illustration of this can be found in a paper on Fogs and Fog Signals of the Pacific coast by Ferdinand Lee Clarke.[6] It is there shown that the sirens around the Golden Gate and in San Francisco Bay are inaudible at certain points. Here there is an interference of sound waves due to numerous natural reflections. It has been suggested that if the fog signals at Lime Point and at Point Bonita were properly attuned a resulting harmonic might be heard at certain points instead of the weakened noise now heard. We need measurements of the energy producing the air pulsation, the proportionate energy reaching the ship or given point, and the rate of expenditure with different conditions of density and air movement. By the employment of suitable resonators the pulsations reaching the ship might be more easily detected. With the introduction of wireless telegraphy, it would almost seem practicable to obtain by this same principle of resonance etherial electromagnetic signals, and by comparing the time intervals between these and the sound waves in air or transmitted through water, the distance apart of the vessels or the distance from the shore might be determined within a few feet.

NOTES BY THE EDITOR.

THE MILWAUKEE CONVENTION OF WEATHER BUREAU OFFICIALS.

After collecting the opinions of a large number of Weather Bureau officials and giving due weight to the inducements offered by local authorities, the Chief of Bureau has concluded that it will be wisest to recommend that the second general convention of Weather Bureau officials be held in Milwaukee late in August or early in September, 1901. In accordance with this recommendation the Honorable Secretary of Agriculture has approved of the proposed convention and has authorized the acceptance of the proffered hospitality of that city. The headquarters of the convention will be at the Hotel Pfister. The freedom of the Milwaukee Press Club is offered to the members of the convention by its President, Mr. W. A. Bowdish. Mr. W. M. Wilson, Section Director at Milwaukee, states that an informal reception and a banquet will be given by the citizens through the Press Club. Those who desire to visit the Pan-American Exposition at Buffalo will, undoubtedly find special inducements in the way of excursion tickets ready at hand. It is probable that three days, viz, Tuesday, Wednesday, and Thursday of the last week in August, or the same days of the succeeding week, but preferably the former, will be sufficient in which to transact the business and pleasures of the convention. Sessions will be held in the morning and afternoon, but not at night. It is hoped that about one hundred officials will be present.

STATION LIBRARIES.

By direction of the Chief of the Bureau, about one hundred selected stations have lately been supplied with the following books: Irrigation and Drainage, by F. H. King. Light, Visible and Invisible, by S. P. Thompson. College Algebra, by E. A. Bowser. Elements of Physics, by Henry Crew. Matter and Motion, by J. Clerk Maxwell. A Students' Standard Dictionaay (abridged from Funk & Wagnalls' Standard). English Grammar, by William Cobbett. Realm of Nature, by H. R. Mill. Elements of Plane and Spherical Trigonometry, by C. W. Crockett. New Astronomy, by D. P. Todd. Text-book of Physics, by W. Watson.

In addition to these, most of the stations had already been provided with the meteorologies of Loomis, Waldo, Buchan, and Scott, Greeley's American Weather, Pope's Electric Telegraph, Abercromby's Principles of Forecasting, Ley's Study and Forecast of Weather, and Rosser's Law of Storms. The section centers of the Climate and Crop Service have also the agricultural works by Storer and Johnson.

Most of the stations also have all the Weather Bureau publications, MONTHLY WEATHER REVIEWS, Bulletins Professional Papers, Annual Reports, Ferrel's Recent Advances in Meteorology, Abbe's Meteorological Apparatus and Methods, Bigelow's Report on International Cloud Observations, Marvin's various Instructions for the use of Instruments and Psychrometric Tables, etc. Those who desire to consult works on meteorology will, therefore, do well to visit the nearest Weather Bureau station.

LECTURES AND INSTRUCTION BY WEATHER BUREAU MEN.

Mr. P. H. Smyth, Observer Weather Bureau, at Cairo, Ill., reports, under date of January 20 that the students of the Douglas School, W. T. Phelps, Principal, are studying the daily weather maps and the work of the Weather Bureau. In addition to the regular instruction, lectures are delivered by Mr. Smyth.

Mr. Alfred F. Sims, Local Forecast Official, Albany, N. Y., lectured on meteorology at the State Normal College, January 28, and before a popular audience on January 25. The latter lecture was finely illustrated with about forty lantern

[4] Consult article, Sound Signals, by Arnold B. Johnson, Chief Clerk, Lighthouse Board, Appleton's Annual Cyclopedia, 1883, p. 719.

[5] See MONTHLY WEATHER REVIEW, November, 1900, p. 492.

[6] Published in 1888 in San Francisco.

slides. The title of these lectures, "A Meteorologist's Dream," or "Dreaming in the Interest of Mankind," shows the happy combination of poetry and science that characterizes Mr. Sims's popular lectures.

Mr. S. S. Bassler, Local Forecast Official, Cincinnati, Ohio, lectured on January 24 before the Cincinnati Technical School on meteorology as illustrating the general principle of "What is worth doing at all is worth doing well."

CUMULUS CLOUDS ABOVE COLUMNS OF SMOKE.

Referring to the MONTHLY WEATHER REVIEW for August, 1900, page 325, and October, page 433, Mr. George C. Stocking, voluntary observer at Grand Mound, Washington, reports as follows:

In August last, about sixty acres of heavy fir slashing was being burned. This produced a column of very dense black smoke which rose to a great height. I made an estimate of the height of the column at the time; the distance from me was about two miles and the angular elevation of the top of the column about 30°. When it reached its greatest height, the top of the column turned white, overflowed and spread out, presenting every appearance of a large cumulus cloud. Occasionally it would boil up in the center above the general level of the top of the cloud and spill over upon the great mass below. There were a few cirrus clouds high up, but no other cumulus clouds in sight. The time of day was about 2 p. m. [Pacific or one hundred and twentieth meridian time.—ED.] The fire and smoke were to the southeast of me. I did not think of the white and cloudy appearance as being due to any reflection of light, but supposed it to be a true cumulus cloud caused by the condensation of the moisture contained in the ascending column of heated air.

I remember observing another column of smoke about ten miles distant in the north. This column did not spread out, but stood up tall and impressive, like a rather dark cumulus cloud, but the sky was overcast.

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Professor of Meteorology.

CHARACTERISTICS OF THE WEATHER FOR JANUARY.

The characteristics of January, 1901, were unusual warmth and dryness. The areas of low pressure for the most part moved rapidly along the northern boundary and down the St. Lawrence Valley. There were no very severe cold waves and snowfall was below the average.

PRESSURE.

The distribution of monthly mean pressure is graphically shown on Chart IV and the numerical values are given in Tables I and VI.

There were no special features as regards the distribution of monthly mean pressure. As compared with the preceding month, monthly mean pressure was lower in the Rocky Mountain districts and thence westward to the Pacific coast. Pressure was also low, as compared with the preceding month, on the Atlantic coast, in the Lake region, and the Ohio Valley. It was also below the seasonal average, except in the southern Rocky Mountain region and locally in the northern Plateau.

TEMPERATURE OF THE AIR.

The distribution of monthly mean surface temperature, as deduced from the records of about 1,000 stations, is shown on Chart VI.

Temperature was considerably above the normal in all districts, except a narrow fringe along the Atlantic coast from New England to Florida and in the Great Valley of California from Red Bluff to Sacramento. The region of greatest positive departure was in the upper Missouri Valley, where the daily means ranged from 10° to 12° above the seasonal normal. This great excess in the daily and monthly means of temperature was due to the large number of low areas that moved along the northern boundary, giving southerly and southwesterly winds throughout the northeastern Rocky Mountain slope and the Missouri Valley. The temperature was also much above the seasonal average from northern Texas northward over western Arkansas, Kansas, Oklahoma, and Indian Territory, to the British Possessions. Maximum temperatures above 80° were registered in Florida and in southern Texas and southern California. A maximum temperature as high as 40° was not registered in the Lake Superior region, in northern Minnesota, and the northeastern portion of North Dakota. Minimum temperatures below freezing were not registered in central and southern Florida nor along the coast of California. Freezing temperatures were recorded in northern Florida and quite generally along the Gulf coasts. The lowest minimum recorded at any Weather Bureau station was 36° below zero at Lander, Wyo., and at other points in North Dakota and Minnesota.

The average temperature for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	25.2	− 0.3		
Middle Atlantic	12	33 6	+ 1.1		
South Atlantic	10	46 6	0.0		
Florida Peninsula	7	59.6	− 0.5		
East Gulf	7	51.2	+ 1.4		
West Gulf	7	52 6	+ 5.9		
Ohio Valley and Tennessee	12	36 1	+ 1.8		
Lower Lake	8	26 5	+ 1.1		
Upper Lake	9	20 4	+ 2.9		
North Dakota	8	9.4	+ 6.5		
Upper Mississippi Valley	11	27.3	+ 6.2		
Missouri Valley	10	28 9	+ 9.0		
Northern Slope	7	24 3	+ 7.3		
Middle Slope	6	34.5	+ 5.4		
Southern Slope	6	43 6	+ 5.2		
Southern Plateau	15	38.2	+ 8.1		
Middle Plateau	9	29.3	+ 5.7		
Northern Plateau	10	27.8	+ 4.0		
North Pacific	9	39.3	+ 0 4		
Middle Pacific	5	47.4	+ 0.3		
South Pacific	4	52.8	+ 2 2		

In Canada.—Prof. R. F. Stupart says:

Temperature was a little below average in eastern and northeastern Ontario, in western Quebec, and also over the greater portion of British Columbia, and above the average over the large remaining portion of Canada. In many parts of Alberta and Assiniboia the average was exceeded by from 6° to 8°.

PRECIPITATION.

Much less than the average amount of rain and snow fell in all districts, except the middle and south Atlantic coast region. The rainfall in the central and eastern Gulf States,

and in portions of Florida, Georgia, and in South Carolina was ample for the needs of the season, although somewhat less than the normal for the time and place. An abundance of rain fell on the Pacific coast. Heavy rains fell in southern California where drought has prevailed for the last three years. Snowfall was deficient in amount and not well distributed. At the close of the month the ground was covered with snow in New England, the Middle Atlantic States, except in southern New Jersey, Delaware, and the coast region of Maryland and Virginia. The ground was also covered in the lower Lake region, including Ohio; the upper Lake region, and throughout northern Indiana, Illinois, northeastern Iowa, Minnesota, and the northeastern portion of North Dakota. Snow covered the ground also in the mountain districts of Colorado, Wyoming, Montana, Nevada, California, Idaho, and northeastern Oregon.

The distribution of snowfall is shown by Chart IX, and the amount on the ground at the end of the month by Chart X.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	10	2.47	61	−1.6	
Middle Atlantic	12	2.39	67	−1.2	
South Atlantic	10	2.84	67	−1.4	
Florida Peninsula	7	2.64	90	−0.3	
East Gulf	7	4.65	89	−0.6	
West Gulf	7	1.66	48	−1.8	
Ohio Valley and Tennessee	12	2.37	57	−1.8	
Lower Lake	8	2.05	77	−0.6	
Upper Lake	9	1.22	60	−0.8	
North Dakota	8	0.34	53	−0.3	
Upper Mississippi Valley	11	1.11	64	−0.6	
Missouri Valley	10	0.44	42	−0.6	
Northern Slope	7	0.25	37	−0.4	
Middle Slope	6	0.24	29	−0.6	
Southern Slope	6	0.25	24	−0.8	
Southern Plateau	15	1.17	100	0.0	
Middle Plateau	9	1.00	71	−0.4	
Northern Plateau	10	1.69	81	−0.4	
North Pacific	9	7.10	99	−0.1	
Middle Pacific	5	6.55	118	+1.0	
South Pacific	4	4.48	167	+1.8	

In Canada.—Professor Stupart says:

Precipitation was generally above average in the Northwest Territories, also in many portions of the Maritime Provinces, but elsewhere in Canada, except very locally, it was below average. The deficiency in parts of British Columbia amounted to from one and one-half to two and one-half inches, while in Quebec the mean was about an inch below the average. In Ontario it was as much as 2.7 inches below average at Kingston, and 1 inch below at Southampton. At the end of the month the ground was well covered with snow in nearly all portions of Canada, this being especially the case in the Qu'Appelle Valley, northern and eastern Ontario, the Province of Quebec, and the greater portion of the Maritime Provinces. Qu'Appelle reports 38 inches of snow on the ground; White River 24 inches; Clontarf and Ottawa, 30 inches; Montreal 26 inches; Quebec 25 inches; Father Point, 33 inches; Fredericton, 22 inches; Sussex and Point Le Preaux, 30 inches.

SLEET.

The following are the dates on which sleet fell in the respective States:

Alabama, 17. Arizona, 29. Arkansas, 9. California, 1, 2, 3, 4, 6, 8, 11, 12, 24, 25, 31. Colorado, 8, 9, 25. Connecticut, 7, 9, 10, 11, 12, 14, 15, 24. District of Columbia, 24. Georgia, 17, 26. Idaho, 6. Illinois, 9, 10, 11, 14, 17, 22, 23, 25, 26, 29, 30. Indiana, 9, 10, 11, 21, 23, 27, 29, 30, 31. Indian Territory, 9, 10, 30. Iowa, 6, 7, 9, 10, 16, 23, 24, 25, 26, 27, 29, 31. Kansas, 9, 25, 26. Kentucky, 25, 26, 27, 29. Maine, 9, 24, 26, 27. Maryland, 7, 18, 22, 24, 25. Massachusetts, 9, 10, 11, 12, 23, 24. Michigan, 6, 7, 8, 9, 10, 14, 15. Minnesota, 13, 15. Mississippi, 11, 30. Missouri, 7, 8, 9, 10, 11, 17, 22, 24, 25, 26. Nebraska, 24, 25, 26. Nevada, 24. New Hampshire, 8, 9, 12, 22, 24. New Jersey, 10, 13, 15, 18, 25. New Mexico, 9, 25, 27, 29. New York, 7, 9, 10, 11, 12, 13, 14, 15, 16, 19, 21. North Carolina, 2, 17, 18, 25, 26, 27, 29, 30. Ohio, 9, 11, 14, 23, 24, 25, 27, 29, 30. Oklahoma, 8, 9, 10. Oregon, 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 14, 22, 23, 24. South Dakota, 28. Tennesseee, 17, 24, 26, 27, 30. Texas, 1, 10, 18, 19. Utah, 4, 5, 6, 7, 12, 21, 22. Vermont, 7, 8, 9, 10, 12, 22. Virginia, 24, 26, 27, 28. Washington, 2, 3, 4, 11, 21, 22, 24, 30. West Virginia, 7, 12, 24, 25, 30. Wisconsin, 6, 8, 9, 14, 23. Wyoming, 8.

HAIL.

The following are the dates on which hail fell in the respective States:

Arizona, 8, 28, 29. Arkansas, 23. California, 9, 11, 24, 31. Florida, 4. Kentucky, 23. Louisiana, 16. Missouri, 23. New Mexico, 29. Oregon, 1, 2, 4, 5, 6, 7, 8, 10, 11, 21, 23, 24. Pennsylvania, 7, 10, 11, 12, 18. South Carolina, 17, 27, 29.

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

The averages for the various districts, with departures from the normal, are shown in the table below:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	6.4	+0.6	Missouri Valley	4.2	−0.9
Middle Atlantic	5.9	+0.3	Northern Slope	4.6	0.0
South Atlantic	5.0	−0.3	Middle Slope	3.8	0.0
Florida Peninsula	4.2	−0.5	Southern Slope	4.9	+1.1
East Gulf	4.9	−0.7	Southern Plateau	3.5	+0.6
West Gulf	5.4	0.0	Middle Plateau	5.0	+0.2
Ohio Valley and Tennessee	6.2	−0.2	Northern Plateau	7.0	−0.3
Lower Lake	8.2	+0.7	North Pacific Coast	7.5	+0.4
Upper Lake	7.3	+0.5	Middle Pacific Coast	5.6	+0.5
North Dakota	4.3	−0.4	South Pacific Coast	5.0	+0.9
Upper Mississippi	5.0	−0.3			

HUMIDITY.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	75	− 1	Missouri Valley	68	−10
Middle Atlantic	74	− 1	Northern Slope	71	+ 1
South Atlantic	74	− 4	Middle Slope	63	− 4
Florida Peninsula	78	− 4	Southern Slope	54	−10
East Gulf	74	− 4	Southern Plateau	48	− 3
West Gulf	72	− 3	Middle Plateau	67	− 2
Ohio Valley and Tennessee	75	− 2	Northern Plateau	80	1
Lower Lake	80	− 1	North Pacific Coast	88	+ 1
Upper Lake	84	+ 2	Middle Pacific Coast	81	0
North Dakota	80	− 1	South Pacific Coast	71	− 3
Upper Mississippi	79	+ 1			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which

also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Atlantic City, N. J.	19	60	nw.	Nantucket, Mass	26	56	n.
Block Island, R. I.	3	55	nw.	New York, N. Y.	12	58	nw.
Do.	18	60	nw.	Do.	18	51	nw.
Do.	25	53	n.	Do.	19	72	nw
Do	26	58	n.	Do.	28	54	nw.
Buffalo, N. Y	16	64	w.	Do	29	52	nw.
Cape Henry, Va	25	51	nw.	Point Reyes Light, Cal.	24	72	nw.
Carson City, Nev	2	61	sw.	Port Huron, Mich.	16	50	w.
Do	3	58	sw.	Portland, Oreg.	12	52	s.
Cheyenne, Wyo.	13	54	nw.	Sacramento, Cal.	3	60	se.
Chicago, Ill.	16	52	w.	Do.	4	54	se.
Do	20	53	s.	San Francisco, Cal	3	57	se.
Cleveland, Ohio	19	60	nw.	Sioux City, Iowa	8	54	nw.
Hatteras, N. C.	25	56	nw.	Do.	15	50	nw.
Miles City, Mont.	15	60	nw.	Do.	24	50	nw.
Milwaukee, Wis.	9	50	ne.	Valentine, Nebr.	15	58	nw.
Mount Tamalpais, Cal.	24	54	nw.	Williston, N. Dak.	16	60	n.
Do.	25	53	nw.	Winnemucca, Nev.	3	50	s.
Do.	31	53	nw.	Do.	4	53	s.
Nantucket, Mass	25	55	n.				

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 210 thunderstorms were received during the current month as against 266 in 1900 and 261 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 22d, 28; 23d, 35; 24th, 31.

Reports were most numerous from: Missouri, 36; Louisiana and West Virginia, 14.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, December 31, 1900, to January 8, 1901.

In Canada.—Auroras were reported as follows: Quebec, 22d; Swift Current, 21st, 22d; Banff, 7th; Prince Albert, 21st; Battleford, 21st, 22d, 23d, 24th.

DESCRIPTION OF TABLES AND CHARTS.

By ALFRED J. HENRY, Professor of Meteorology.

Table I gives, for about 145 Weather Bureau stations making two observations daily and for about 25 others making only one observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation, the total depth of snowfall, and the mean wet-bulb temperatures. The altitudes of the instruments above ground are also given.

Table II gives, for about 2,700 stations occupied by voluntary observers, the highest maximum and the lowest minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station; the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (. . . .).

Table III gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions based on these two observations only and without considering the velocity of the wind The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I. By adding the four components for the stations comprised in any geographical division the average resultant direction for that division can be obtained.

Table IV gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table V gives a record of rains whose intensity at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes..	5	10	15	20	25	30	35	40	45	50	60	80	100	120
Rates pr. hr. (ins.)..	3.00	1.80	1.40	1.20	1.08	1.00	0.94	0.90	0.86	0.84	0.75	0.60	0.54	0.50

In the northern part of the United States, especially in the colder months of the year, rains of the intensities shown in the above table seldom occur. In all cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest rainfall of any single storm has been given, also the greatest hourly fall during that storm.

Table VI gives, for about 30 stations furnished by the Canadian Meteorological Service, Prof. R. F. Stupart, director, the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

Table XI gives the heights of rivers referred to zeros of gages.

NOTES EXPLANATORY OF THE CHARTS.

Chart I, tracks of centers of high areas, and Chart II, tracks of centers of low areas, are constructed in the same way. The roman numerals show number and chronological order of highs (Chart I) and lows (Chart II). The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the 8 a. m. and 8 p. m., seventy-fifth meridian time, observations. Within each circle is also given (Chart I) the highest barometric reading and (Chart II) the lowest pressure at or near the center at that time.

Chart III.—Total precipitation. The scale of shades showing the depth of rainfall is given on the chart itself. For isolated stations the rainfall is given in inches and tenths, when appreciable; otherwise, a "trace" is indicated by a capital T, and no rain at all, by 0.0.

Chart IV.—Sea-level pressure, temperature, and resultant surface winds. The wind directions on this Chart are the computed resultants of observations at 8 a. m. and 8 p. m., daily; the resultant duration is shown by figures attached to each arrow. The temperatures are the means of daily maxima and minima and are reduced to sea level. The pressures are the means of 8 a. m. and 8 p. m. observations, daily, and are reduced to sea level and to standard gravity. The reduction for 30 inches of the mercurial barometer, as for-

merly shown by the marginal figures for each degree of latitude, has already been applied.

Chart V.—Hydrographs for seven principal rivers of the United States.

Chart VI.—Surface temperatures; maximum, minimum, and mean. Lines of equal monthly mean temperature in red; lines of equal maximum temperature in black; and lines of equal minimum temperature (dotted) also in black.

Chart VII.—Percentage of sunshine. The average cloudiness at each Weather Bureau station is determined by numerous personal observations during the day. The difference between the observed cloudiness and 100, it is assumed, represents the percentage of sunshine, and the values thus obtained have been used in preparing Chart VII.

Chart VIII.—West Indian monthly isobars, isotherms, and resultant winds.

Chart IX.—Total snowfall.

Chart X.—Depth of snow on ground at close of month.

TABLE 1.—*Climatological data for Weather Bureau Stations, January*, 1901.

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.										Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Mean actual, 8 a. m. + 8 p. m. ÷ 2.	Mean reduced.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.					Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
New England.							25.2	— 0.3											75	2.47	— 1.6								6.4	
Eastport	76	69	74	29.82	29.92	— .08	19.5	— 0.9	41	9	27	—15	20	12	37	18	14	80	75	4.80	+ 0.8	20	10,372	nw.	44	ne.	12	8	4	19	7.1	26.7
Portland, Me.	108	81	117	29.81	29.92	— .13	21.3	— 1.2	47	9	28	—11	20	14	34	19	18	72	74	3.34	— 0.3	13	7,119	nw.	36	se.	16	8	11	12	5.9	24.2
Northfield	876	15	65	28.99	30.00	— .07	15.5	0.0	45	21	25	—24	20	6	48	13	9	80	74	1.43	— 1.7	12	7,229	s.	42	s.	16	4	11	16	7.1	11.4
Boston	135	115	181	29.82	29.96	— .10	27.6	+ 0.6	50	9	35	— 3	20	20	32	23	19	72	74	1.56	— 2.5	10	8,997	nw.	28	nw.	19	11	4	16	5.9	7.8
Nantucket	12	43	85	29.94	29.95	— .08	31.5	+ 0.1	49	16	37	2	20	26	38	29	24	75	74	3.08	— 0.7	13	13,434	nw.	56	n.	26	3	5	23	8.1	11.6
Block Island	26	11	70	29.94	29.97	— .11	30.8	— 0.3	50	16	36	2	20	25	33	28	23	72	74	1.95	— 2.2	11	16,605	nw.	60	nw.	18	9	12	10	5.6	3.8
Narragansett	.....	10	.....	.....	.....	.....	27.7	— 1.1	51	9	36	— 4	20	20	36	....	....	....	....	2.29	— 3.0	11	.....	nw.	...	.....	...	15	7	9	....	4.1
New Haven	106	117	140	29.86	29.88	— .13	29.0	+ 0.5	49	16	35	— 1	20	21	29	25	20	72	74	1.38	— 2.9	11	7,372	n.	33	nw.	19	11	10	10	5.2	6.2
Mid. Atlan. States.							33.6	+ 1.1											74	2.39	— 1.2								5.0	
Albany	97	84	113	29.90	30.02	— .07	24.2	+ 1.0	44	9	32	— 6	20	16	32	21	17	78	75	1.59	— 1.3	12	6,479	n.	33	s.	8	10	8	13	6.1	13.4
Binghamton	875	79	90	.....	.....	.....	25.2	+ 2.8	47	16	32	— 4	19	18	38	...	...	....	....	0.76	— 2.2	16	5,543	nw.	28	n.	19	5	10	16	7.1	3.3
New York	314	108	250	29.66	30.01	— .10	31.5	+ 1.0	53	16	37	4	20	26	24	28	22	70	74	2.07	— 2.0	12	13,187	nw.	72	nw.	19	9	9	13	5.8	2.9
Harrisburg	374	94	104	.....	.....	.....	31.0	+ 0.7	50	15	37	11	20	25	24	...	...	....	....	1.83	— 1.8	7	6,344	nw.	38	nw.	19	9	8	14	6.3	7.8
Philadelphia	117	108	184	29.90	30.08	— .11	33.1	+ 1.1	59	16	39	8	20	27	23	30	25	73	74	2.47	— 0.9	10	8,261	nw.	41	nw.	19	10	8	13	5.7	6.3
Scranton	805	111	119	29.12	30.04	— .06	27.6	.....	50	16	35	— 1	20	20	31	25	23	88	....	1.17	.....	13	6,301	ne.	34	nw.	19	7	7	17	6.9	6.3
Atlantic City	52	68	76	29.96	30.02	— .09	33.6	+ 1.1	56	9	40	7	20	28	30	31	26	76	74	3.16	— 0.6	10	9,270	nw.	60	nw.	19	10	14	7	4.8	7.1
Cape May	17	47	51	30.03	30.05	— .07	33.9	— 0.5	55	9	39	7	20	28	27	31	....	....	....	3.42	— 0.4	8	7,229	nw.	38	nw.	19	8	16	7	5.7	7.5
Baltimore	123	68	82	29.90	30.04	— .10	34.9	+ 0.9	64	16	42	14	20	28	27	30	26	73	74	2.45	— 0.9	6	3,792	w.	24	w.	19	7	12	12	6.1	6.5
Washington	112	59	76	29.93	30.06	— .10	34.4	+ 1.2	66	16	42	13	4	27	31	30	24	69	74	2.92	— 0.6	8	5,959	nw.	39	nw.	25	10	8	13	5.7	8.1
Cape Henry	.....	5	33	.....	.....	.....	41.8	+ 1.6	74	11	49	22	20	35	28	....	....	....	....	2.30	— 1.9	9	11,255	s.	51	nw.	25	6	11	14	6.5	T.
Lynchburg	661	83	88	29.30	30.06	— .09	38.3	+ 1.5	68	9	47	16	20	30	35	33	27	68	74	3.59	— 0.4	6	3,645	nw.	32	nw.	25	14	10	7	4.4	4.0
Norfolk	91	102	111	29.96	30.06	— .08	41.2	+ 0.8	74	11	48	21	20	34	31	37	32	75	74	2.09	— 1.7	9	7,435	n.	46	nw.	25	12	5	14	6.0	0.5
Richmond	144	82	90	.....	.....	.....	38.8	.....	68	9	47	18	20	31	33	....	....	....	....	2.80	.....	8	4,165	nw.	25	nw.	19	14	5	12	5.2	5.5
S. Atlantic States.							46.6	0.0											74	2.84	— 1.4								5.0	
Charlotte	773	68	76	29.25	30.10	— .05	41.6	+ 0.4	69	11	50	22	18	33	26	36	30	66	74	2.38	— 2.8	9	5,836	ne.	33	w.	28	13	8	10	4.7	
Hatteras	11	17	36	30.04	30.05	— .08	45.4	— 0.3	68	11	50	29	30	40	29	42	29	82	74	2.90	— 3.0	15	13,449	n.	56	nw.	25	13	7	11	5.2	T.
Kittyhawk	8	12	30	.....	.....	.....	43.6	+ 1.2	68	11	49	27	20	38	24	....	....	....	....	1.96	— 3.2	9	11,497	ne.	....	.....	...	13	6	12	5.4	
Raleigh	376	93	101	29.68	30.10	— .05	41.6	+ 0.8	75	11	51	20	20	32	30	36	30	68	74	2.20	— 1.4	10	5,099	sw.	30	nw.	25	14	4	13	5.0	T.
Wilmington	78	82	90	30.00	30.09	— .05	45.8	— 1.1	73	11	55	25	20	37	29	40	36	77	74	2.48	— 1.5	10	7,218	n.	42	nw.	25	11	10	10	5.1	
Charleston	48	14	92	30.07	30.12	— .03	49.9	— 0.1	72	10	57	31	26	42	25	44	38	72	74	2.25	— 1.8	7	8,836	n.	37	w.	25	13	9	9	4.7	
Columbia	.....	5	.....	.....	.....	.....	45.8	+ 0.1	75	11	56	25	26	36	40	....	....	....	....	3.34	— 0.5	10	.....	nw.	....	.....	...	11	9	11	5.1	
Augusta	180	89	103	29.91	30.11	— .03	46.7	+ 0.1	73	11	56	28	19	37	30	41	36	72	74	4.59	+ 0.1	10	5,312	nw.	38	nw.	27	16	7	8	4.3	
Savannah	65	79	89	30.04	30.11	— .06	51.3	+ 0.3	74	11	60	32	26	43	27	45	41	76	74	3.62	+ 0.4	9	6,369	n.	28	nw.	28	14	9	8	4.6	
Jacksonville	43	69	84	30.07	30.12	— .02	54.2	— 1.0	76	10	64	32	19	45	27	48	44	77	77	4.24	— 0.9	10	6,456	n.	30	nw.	17	18	5	8	4.5	
Florida Peninsula.							54.2	— 0.5											78	3.26	+ 0.5								4.2	
Jupiter	28	13	55	30.05	30.08	— .03	56.6	— 0.1	73	9	64	36	18	49	25	...	...	....	....	2.03	— 2.3	10	.....	ne.	....	.....	...	5	15	11	....	
Key West	22	43	50	30.07	30.09	— .00	64.8	— 0.9	82	12	72	41	19	58	26	38	35	78	78	8.29	+ 4.8	12	8,079	nw.	30	s.	17	18	8	5	3.9	
Tampa	34	60	67	30.08	30.12	— .02	68.1	— 1.6	82	3	72	55	19	64	14	63	60	79	79	0.33	— 1.8	3	8,856	ne.	36	nw.	18	14	13	4	4.1	
East Gulf States.							59.6	+ 0.9	82	1	69	37	19	51	29	53	50	78	74	1.15	— 1.4	7	5,210	nw.	26	sw.	17	11	15	5	4.5	
Atlanta	1,174	139	156	28.86	30.14	— .04	51.2	+ 1.4	66	11	52	23	18	36	28	39	35	74	74	4.65	— 0.6	13	9,522	nw.	45	nw.	27	11	10	10	4.9	
Macon	370	93	99	.....	.....	.....	44.2	+ 1.7	68	11	52	23	18	36	28	39	35	74	74	5.95	+ 0.2	13	9,522	nw.	45	nw.	27	11	10	10	5.1	
Pensacola	56	78	90	.....	.....	.....	47.0	.....	72	11	57	28	18	37	31	....	....	....	....	3.53	.....	9	5,418	nw.	38	nw.	27	12	11	8	4.4	
Mobile	57	88	96	30.10	30.16	+ .01	53.2	+ 0.7	71	30	61	34	18	46	25	....	....	....	....	3.18	— 1.5	11	7,129	n.	30	nw.	17	12	9	10	5.1	
Montgomery	223	100	112	29.90	30.14	— .08	51.5	+ 1.0	70	16	60	33	18	43	28	47	44	80	74	4.62	— 0.5	12	6,369	n.	33	nw.	27	14	4	13	5.3	
Meridian	375	84	98	....	.....	.....	49.4	+ 1.1	70	9	59	30	18	40	28	44	38	72	74	4.75	— 0.6	11	5,447	nw.	30	w.	27	11	11	9	5.0	
Vicksburg	347	65	76	29.87	30.14	— .02	48.2	+ 1.2	71	10	59	26	31	38	35	....	....	....	....	3.86	— 1.8	10	4,426	n.	29	nw.	27	14	8	9	4.7	T.
New Orleans	51	88	121	30.10	30.16	+ .04	51.3	+ 0.3	72	9	60	29	31	42	28	45	38	67	77	8.56	+ 3.0	8	5,652	n.	40	nw.	17	18	8	10	5.1	
Port Eads	.....	27	...	.....	.....	.....	55.6	+ 1.8	75	16	64	36	18	47	25	50	47	77	77	4.24	— 0.9	10	6,456	n.	30	nw.	17	18	5	8	4.5	
West Gulf States.							56.6	— 0.1	73	9	64	36	18	49	25	...	...	....	....	2.03	— 2.3	10	.....	ne.	....	.....	...	5	15	11	....	
Shreveport	249	77	84	29.89	30.16	— .00	52.6	+ 5.2											72	1.66	— 1.8								5.4	
Fort Smith	457	79	94	29.62	30.13	— .02	51.4	+ 5.5	71	8	60	26	12	42	31	45	39	69	72	2.80	— 1.7	6	5,614	s.	34	nw.	17	11	5	15	5.7	
Little Rock	357	93	100	29.75	30.15	— .02	45.4	+ 9.8	72	21	55	20	1	36	34	38	30	61	69	0.96	— 1.4	4	6,801	e.	36	w.	27	13	3	15	5.2	T.
Corpus Christi	18	42	50	30.12	30.14	+ .01	47.0	+ 6.2	71	8	56	23	31	38	29	42	37	75	75	2.11	— 2.8	7	6,481	nw.	36	nw.	17	12	11	8	4.9	T.
Fort Worth	670	106	114	29.41	30.14	— .02	57.8	+ 2.3	76	29	64	32	1	52	21	54	51	82	75	0.75	— 2.1	7	7,094	se.	28	s.	9	12	7	12	4.8	
Galveston	54	106	112	30.07	30.12	.00	50.8	.....	80	15	62	17	1	39	42	42	33	59	59	0.08	.....	2	8,951	sw.	36	n.	17	13	11	7	4.2	
Palestine	510	73	79	29.60	30.16	+ .01	57.1	+ 4.4	72	24	62	40	3	52	16	54	32	87	87	1.39	— 2.3	8	9,034	se.	33	nw.	11	9	12	10	5.8	
San Antonio	701	67	77	29.39	30.15	+ .02	52.8	+ 9.0	72	22	62	27	1	44	33	46	40	67	67	3.14	— 1.2	4	6,530	s.	34	nw.	17	11	8	12	5.9	
Ohio Val. & Tenn.							56.4	+ 4.9	80	29	66	26	1	47	32	50	46	74	74	0.41	— 1.3	4	4,357	s.	20	nw.	27	4	14	13	6.4	
Chattanooga	762	106	112	29.33	30.17	+ .01	56.1	+ 1.8											75	2.37	— 1.8								6.2	
Knoxville	1,004	10	88	29.05	30.16	— .02	41.6	+ 0.6	67	15	50	23	31	33	29	36	31	68	75	5.30	— 0.9	9	5,877	nw.	39	nw.	25	11	11	9	5.1	T.
Memphis	337	140	154	29.72	30.16	.00	39.0	+ 1.3	65	8	47	21	18	31	29	34	29	75	75	4.31	— 1.2	10	5,972	sw.	40	nw.	24	7	11	13	6.1	0.1
Nashville	546	128	134	29.56	30.16	+ .01	46.4	+ 6.5	69	8	54	24	2	39	21	40	33	64	64	3.42	— 2.1	6	8,394	nw.	42	nw.	24	13	9	9	5.1	T.
Lexington	989	75	102	.....	.....	.....	40.0	+ 1.8	67	8	48	18	31	32	28	35	30	70	70	3.45	— 1.6	8	5,547	nw.	33	nw.	24	11	13	7	4.7	T.
Louisville	525	114	136	29.53	30.13	— .03	34.2	+ 0.9	63	9	42	11	31	26	32	....	....	....	....	1.49	— 2.3	8	9,376	s.	43	nw.	24	8	9	14	6.2	0.2
Evansville	434	72	82	.....	.....	.....	36.0	+ 1.9	66	8	44	14	31	28	29	32	27	73	73	0.98	— 3.0	7	7,118	sw.	35	nw.	24	8	8	15	5.9	0.7
Indianapolis	822	154	164	29.18	30.11	— .03	37.4	.....	65	8	45	14	1	30	24	....	....	....	....	1.05	.....	6	5,485	nw.	30	s.	8	17	8	6	3.8	T.
Cincinnati	628	152	157	29.42	30.12	— .03	30.0	+ 1.7	60	15	38	2	31	22	29	27	23	79	79	1.59	— 1.4	11	8,791	w.	39	s.	10	5	8	18	7.0	6.0
Columbus	824	87	100	29.17	30.10	— .03	33.2	+ 0.7	62	8	41	6	31	25	32	30	25	75	75	0.87	— 2.6	9	6,816	sw.	41	w.	24	6	8	17	6.7	2.8
Pittsburg	842	116	123	29.12	30.06	— .08	30.4	+ 2.0	57	10	38	0	31	23	39	27	24	79	79	1.50	— 1.8	16	6,824	sw.	34	w.	19	8	3	20	6.9	7.7
Parkersburg	638	77	84	29.41	30.18	— .02	32.5	+ 1.9	59	10	39	10	20	26	29	29	24	74	74	1.98	— 1.2	18	5,760	nw.	26	nw.	16	2	9	20	7.8	6.4
Elkins	1,940	41	50	27.96	30.10	— .05	33.6	+ 0.9	60	8	41	10	31	26	41	31	29	87	87	1.18	— 1.9	15	5,194	nw.	43	nw.	19	7	3	21	7.7	5.3
Lower Lake Region.							30.7	.....	57	10	40	— 3	20	21	55	27	24	81	80	3.65	.....	18	4,162	w.	35	w.	24	1	13	17	7.7	25.1
Buffalo	767	178	206	29.14	30.01	— .07	26.5	+ 1.1											80	2.05	— 0.6								6.2	
Oswego	335	76	87	29.61	30.00	— .09	26.6	+ 2.2	48	16	33	— 2	19	20	38	24	20	76	76	3.31	+ 0.3	25	12,621	w.	64	w.	16	0	9	22	8.4	18.1
Rochester	523	81	90	29.40	30.00	— .08	23.6	— 0.7	46	16	31	— 4	19	16	42	22	20	86	86	2.73	— 0.2	21	10,136	se.	38	nw.	12	0	5	26	9.2	16.7
Erie	713	92	102	29.22	30.03	— .06	25.0	+ 1.1	48	20	32	— 3	19	18	50	23	20	81	81	3.83	+ 0.7	27	6,813	sw.	37	sw.	16	0	5	26	9.0	29.8
Cleveland	762	190	201	29.19	30.05	— .05	28.8	+ 1.9	54	10	35	3	19	22	43	26	24	84	84	1.30	— 2.0	20	9,965	sw.	41	sw.	20	0	7	24	8.4	7.0
Sandusky	629	62	70	29.34	30.06	— .05	28.3	+ 2.1	56	10	35	7	3	22	41	25	20	78	78	1.18	— 1.4	17	13,551	w.	60	nw.	19	3	7	21	8.0	5.1
Toledo	628	123	127	29.34	30.06	— .04	27.6	+ 1.1	55	10	35	3	2	21	38	26	22	78	78	1.12	— 1.1	16	7,417	sw.	44	nw.	19	5	3	23	8.1	4.3
Detroit	730	160	190	29.21	30.04	— .02	26.7	+ 0.6	52	8	34	1	31	20	40	24	21	79	79	1.38	— 0.7	15	8,490	sw.	42	nw.	18	8	5	18	6.8	8.2
Upper Lake Region.							25.1	+ 0.6	50	20	31	1	19	19	38	24	22	85	79	1.52	— 0.4	13	9,412	w.	48	sw.	16	6	2	23	8.1	12.6
Alpena	609	63	80	29.29	29.99	— .07	20.4	+ 2.9											84	1.22	— 0.8								7.3	
Escanaba	612	43	57	29.30	30.01	— .05	20.4	+ 2.3	44	20	27	— 8	19	14	36	19	17	85	85	1.20	— 1.3	14	9,068	w.	38	e.	10	6	4	21	7.7	14.5
Grand Haven	632	55	92	29.30	30.02	— .04	17.5	+ 3.5	36	21	25	— 9	1	10	29	16	15	93	93	0.74	— 0.9	10	6,809	w.	38	n.	18	4	8	19	7.7	8.2
Houghton	668	66	74	.....	.....	.....	25.4	+ 1.2	46	18	32	2	19	19	29	24	22	84	84	1.96	— 0.7	19	10,817	nw.	47	nw.	18	2	4	25	8.5	16.6
Marquette	734	79	116	29.15	30.00	— .05	16.3	.....	41	23	24	— 7	1	8	37	....	....	....	....	2.67	.....	21	5,345	nw.	32	nw.	8	2	7	22	8.2	25.9
Port Huron	638	70	120	29.32	30.05	— .04	18.8	+ 2.8	40	20	24	— 6	1	13	25	17	16	90	90	2.08	0.0	16	9,963	nw.	43	sw.	19	4	5	22	7.7	22.5
Sault Ste. Marie	614	40	61	29.25	29.96	— .07	25.2	+ 3.4	54	20	33	— 3	3	18	34	22	20	87	87	1.10	— 1.0	14	9,793	nw.	50	w.	16	7	2	22	7.5	10.9
Chicago	823	241	274	29.14	30.07	— .03	16.1	+ 1.8	36	16	24	—16	19	8	26	15	13	86	86	1.40	— 0.4	14	6,739	se.	47	w.	8	3	10	18	7.5	14.0
Milwaukee	681	134	142	29.27	30.05	— .04	26.0	+ 2.6	54	20	33	— 5	1	19	27	24	21	83	83	1.15	— 1.0	8	13,729	nw.	53	s.	20	10	6	15	6.5	9.2
Green Bay	617	49	57	29.33	30.05	— .05	23.5	+ 4.1	49	20	30	— 8	1	17	25	22	18	78	78	1.33	— 0.8	16	9,278	w.	50	no.	9	10	2	19	6.7	14.4
Duluth	702	95	115	29.22	30.04	— .07	18.7	+ 4.5	43	20	26	— 7	1	11	27	17	12	75	75	0.90	— 1.5	10	6,396	w.	35	sw.	16	6	8	17	7.2	12.3
North Dakota.							12.9	+ 2.5	39	20	21	—19	2	5	30	11	7	78	80	0.36	— 0.7	10	6,744	sw.	48	nw.	17	7	17	7	5.4	3.8
Moorhead	935	54	60	29.02	30.12	— .05	11.6	+ 9.1											80	0.37	— 0.3								4.3	
Bismarck	1,674	16	29	28.21	30.12	— .07	9.2	+10.1	42	20	18	—18	2	0	28	7	6	91	91	0.54	— 0.2	13	8,288	nw.	37	se.	25	10	15	6	5.2	5.5
Williston	1,878	15	31	27.96	30.13	— .04	14.6	+10.1	52	13	26	—20	1	4	39	10	4	67	67	0.03	— 0.5	3	7,941	nw.	46	nw.	16	20	6	5	3.7	0.3
							11.0	+ 7.1	43	18	21	—23	1	1	37	9	6	82	82	0.54	— 0.1	10	7,299	w.	60	n.	16	18	11	2	4.0	5.4

TABLE I.—*Climatological data for Weather Bureau Stations, January, 1901*—Continued.

Stations.	Elevation of instruments: Barometer above sea level, feet.	Elevation of instruments: Thermometers above ground.	Elevation of instruments: Anemometer above ground.	Pressure, in inches: Mean actual, 8 a. m. + 8 p. m. + 2.	Pressure, in inches: Mean reduced.	Pressure, in inches: Departure from normal.	Temperature of the air, in degrees Fahrenheit: Mean max. + mean min. + 2.	Temperature: Departure from normal.	Temperature: Maximum.	Temperature: Date.	Temperature: Mean maximum.	Temperature: Minimum.	Temperature: Date.	Temperature: Mean minimum.	Temperature: Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches: Total.	Precipitation: Departure from normal.	Precipitation: Days with .01, or more.	Wind: Total movement, miles.	Wind: Prevailing direction.	Wind: Maximum velocity: Miles per hour.	Wind: Maximum velocity: Direction.	Wind: Maximum velocity: Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
Upper Mis. Valley.							27.3	+ 6.2										79	1.11	— 0.6									5.0	
Minneapolis	.....	99	208	.....	.....	.....	15.2	+ 3.3	42	15	24	—13	2	6	35	...	...	...	0.31	— 0.5	4	8,610	nw.	38	nw.	15	7	11	13	...	5.8
St. Paul	837	114	124	29.10	30.08	— .07	16.2	+ 5.6	42	15	24	—10	2 2	8	30	15	12	83	0.37	— 0.6	6	6,614	nw.	34	w.	15	13	7	11	5.4	3.7
La Crosse	714	70	78	.....	.....	.....	20.6	+ 5.9	45	20	28	— 5	30	13	28	...	...	...	0.64	— 0.6	8	5,983	s.	30	w.	15	8	11	12	6.1	11.4
Davenport	606	71	79	29.39	30.08	— .06	26.6	+ 6.6	54	20	34	— 3	30	19	27	24	21	82	1.10	— 0.6	8	6,624	w.	34	w.	16	15	6	10	4.9	7.5
Des Moines	861	84	88	29.14	30.13	— .04	25.3	+ 8.8	57	23	36	— 3	1	17	34	24	21	82	1.01	— 0.3	5	6,364	nw.	26	sw.	20	10	11	10	5.2	10.3
Dubuque	698	101	109	29.28	30.09	— .03	23.6	+ 6.3	52	20	31	—11	1	16	30	22	20	91	1.07	— 0.6	8	6,674	nw.	38	nw.	16	13	8	10	5.2	9.0
Keokuk	614	63	78	29.42	30.11	— .03	30.6	+ 7.4	60	15	38	3	1	23	30	27	23	77	1.41	— 0.3	6	6,472	nw.	34	nw.	16	14	9	8	4.4	0.3
Cairo	356	87	93	29.74	30.14	— .01	39.8	+ 5.1	66	8	48	15	1	32	25	35	30	70	1.52	— 2.3	7	6,925	nw.	36	nw.	24	7	16	8	5.5	1.2
Springfield, Ill.	644	82	93	29.38	30.10	— .05	31.0	+ 5.5	63	18	38	1	1	24	26	27	23	75	1.80	— 0.3	5	7,948	nw.	30	nw.	24	12	10	9	5.2	1.8
Hannibal	534	75	110	.....	.....	.....	33.0	+ 7.1	65	15	41	0	1	25	33	...	...	...	1.85	+ 0.3	4	7,413	sw.	33	s.	20	14	8	9	4.2	1.0
St. Louis	567	111	210	29.48	30.11	— .04	37.2	+ 6.7	69	15	45	8	1	30	31	33	28	74	1.12	— 1.1	6	8,258	s.	37	w.	24	17	5	9	4.3	0.2
Missouri Valley.							38.9	+ 9.0										68	0.44	— 0.6									4.2	
Columbia	784	4	84	.....	.....	.....	34.7	+ 4.7	71	15	44	0	1	25	33	...	...	...	2.32	+ 0.4	5	6,969	nw.	40	nw.	24	15	4	12	4.9	1.2
Kansas City	963	78	95	29.07	30.14	— .04	34.7	+ 9.3	62	15	44	5	1	26	32	30	24	69	0.45	— 0.7	3	6,578	nw.	30	s.	20	16	8	7	3.6	0.2
Springfield, Mo	1,334	100	103	28.68	30.13	— .02	38.0	+ 5.7	70	15	48	8	1	29	28	33	27	69	0.73	— 1.7	4	8,588	nw.	35	nw.	31	15	11	5	3.7	T.
Topeka	.....	81	.....	.....	.....	.....	33.3	+ 6.5	63	14	43	2	1	23	32	...	...	...	0.18	— 1.0	2	.....	w.	.....	.....	...	13	13	5	3.9	T.
Lincoln	1,189	75	84	28.78	30.12	— .07	28.8	+11.1	57	19	38	— 2	1	19	33	24	18	71	0.22	— 0.6	3	8,231	n.	46	nw.	17	17	9	5	3.6	2.5
Omaha	1,105	115	121	28.86	30.11	— .08	27.8	+ 8.6	54	19	36	0	1	19	27	24	20	78	0.31	— 0.4	5	6,683	sw.	38	nw.	15	16	7	8	4.4	3.1
Valentine	2,598	39	40	27.26	30.11	— .10	26.8	+ 9.9	63	19	42	— 8	1	12	45	21	14	68	0.04	— 0.6	1	7,817	nw.	58	nw.	15	16	10	5	4.2	0.4
Sioux City	1,135	96	164	.....	.....	.....	24.2	+ 7.9	54	14	32	1	1	16	29	...	...	...	0.22	— 0.6	4	9,966	nw.	54	nw.	8	12	14	5	4.3	2.0
Pierre	1,572	43	50	28.34	30.11	— .09	24.5	+11.8	59	20	36	— 8	11	13	37	18	8	54	0.08	— 0.4	1	5,964	nw.	49	nw.	15	12	11	8	4.2	0.8
Huron	1,306	56	67	28.62	30.12	— .09	19.8	+12.8	57	20	32	—12	2	8	41	16	10	70	0.13	— 0.4	3	9,655	nw.	49	w.	15	10	15	6	5.0	1.3
Yankton	1,233	52	58	.....	.....	.....	24.8	+10.6	60	14	36	— 6	2	14	38	....	....	....	0.24	— 0.3	4	7,097	nw.	40	nw.	15	13	14	4	4.1	2.1
Northern Slope.							24.3	+ 7.3										71	0.33	— 0.4									4.6	
Havre	2,505	46	47	27.30	30.09	— .08	17.5	+ 7.8	50	12	27	—25	10	8	48	16	13	82	0.56	— 0.3	7	9,462	sw.	49	sw.	11	8	13	10	5.5	5.6
Miles City	2,371	42	50	27.45	30.09	— .09	21.6	+11.0	54	20	33	—18	10	10	38	18	16	89	0.12	— 0.4	2	8,812	nw.	60	nw.	15	18	12	1	2.9	1.2
Helena	4,110	88	93	25.76	30.15	— .02	23.4	+ 6.3	52	13	31	—12	4	16	28	20	15	70	0.56	— 0.8	8	5,747	sw.	42	sw.	13	5	11	15	6.7	5.5
Kalispell	2,965	45	51	26.91	30.16	+ .01	20.8	.....	44	12	27	— 5	6	14	21	19	17	87	1.26	.....	15	3,723	w	36	nw.	15	6	6	19	7.6	9.3
Rapid City	3,234	46	50	26.55	30.04	— .13	27.4	+ 7.2	61	19	42	— 5	4	13	44	22	15	63	0.07	— 0.3	1	5,900	w.	43	nw.	15	20	7	4	3.3	0.7
Cheyenne	6,088	56	64	23.93	30.18	+ .01	29.4	+ 4.4	56	14	41	— 9	1	18	36	22	12	50	0.13	— 0.2	2	10,141	nw.	52	nw.	13	13	14	4	3.7	1.3
Lander	5,372	28	36	24.59	30.20	— .01	23.6	+ 6.8	57	13	38	—36	1	10	51	19	13	67	0.16	— 0.7	3	2,900	sw.	42	w.	13	18	6	7	3.5	1.4
North Platte	2,821	43	52	27.09	30.19	.00	27.4	+ 7.4	64	19	42	—12	2	12	48	20	12	59	0.04	— 0.4	1	5,677	w.	43	nw.	15	18	10	3	3.5	1.0
Middle Slope.							34.5	+ 5.4										63	0.24	— 0.6									3.8	
Denver	5,291	79	151	24.68	30.16	— .01	34.3	+ 6.1	65	14	48	—19	1	21	39	26	15	49	0.05	— 0.5	2	6,709	sw.	45	nw.	11	19	9	3	3.6	1.9
Pueblo	4,685	80	86	25.27	30.14	— .04	33.4	+ 4.7	66	14	49	—23	1	18	55	26	15	51	0.28	— 0.1	2	5,828	w.	38	w.	11	14	16	1	4.2	3.4
Concordia	1,398	42	47	28.60	30.17	— .02	30.2	+ 7.0	61	19	40	— 2	1	21	30	25	22	77	0.24	— 0.6	2	5,147	n.	24	n.	17	22	6	3	2.6	2.2
Dodge	2,509	44	52	27.44	30.16	.00	33.8	+ 7.2	69	14	49	—11	1	19	43	26	21	69	0.13	— 0.3	1	7,128	nw.	41	s.	25	14	14	3	3.9	1.2
Wichita	1,358	78	85	28.66	30.15	— .01	35.2	+ 4.6	67	14	45	3	1	25	34	29	22	64	0.25	— 0.8	1	6,417	n.	36	n.	17	16	6	9	4.3	1.0
Oklahoma	1,214	54	62	28.81	30.15	.00	40.0	+ 3.0	68	15	51	9	1	29	36	33	26	64	0.51	— 1.4	1	7,188	n.	34	s.	20	16	7	8	4.5	
Southern Slope.							44.6	+ 7.2										54	0.03	— 0.3									4.9	
Abilene	1,738	45	54	28.28	30.14	— .02	49.2	+ 6.4	81	15	61	15	1	37	39	40	32	59	0.03	— 0.9	2	6,322	s.	28	nw.	16	10	12	9	5.3	
Amarillo	3,676	54	61	26.27	30.13	— .02	40.0	+ 8.1	73	15	54	4	1	26	49	30	18	48	0.03	— 0.6	2	10,173	sw.	44	sw.	19	13	10	8	4.5	0.2
Southern Plateau.							44.7	+ 1.8										48	1.00	+ 0.3									3.5	
El Paso	3,762	10	110	26.24	30.14	+ .05	47.0	+ 2.5	72	22	60	20	3	34	42	36	22	43	0.35	— 0.2	5	6,754	nw.	39	ne.	16	14	10	7	4.0	
Santa Fe	7,013	47	50	23.25	30.19	+ .05	31.0	+ 3.1	51	21	40	1	2	22	26	24	17	60	1.30	+ 0.7	6	4,765	n.	26	nw.	26	19	8	4	3.0	6.0
Flagstaff	6,907	12	25	23.33	30.26	.....	30.2	.....	56	14	42	— 4	2	18	39	26	...	...	2.85	.....	7	.....	sw.	.....	.....	...	9	11	11	.....	14.2
Phoenix	1,108	47	57	28.89	30.08	+ .02	53.2	+ 3.8	75	19	66	24	11	40	37	43	31	47	0.43	— 0.1	2	2,579	e.	20	e.	17	15	6	10	4.4	
Yuma	141	16	50	29.89	30.04	— .01	54.7	+ 0.6	77	19	68	25	3	42	39	45	28	36	0.12	— 0.3	2	4,679	n.	27	n.	10	21	5	5	2.7	
Independence	3,910	51	58	26.03	30.12	.00	37.6	— 0.8	56	27	47	13	1	28	28	32	23	56	2.81	+ 1.6	6	5,510	nw.	36	n.	31	18	10	3	3.3	7.4
Middle Plateau.							32.3	+ 4.1										67	1.21	— 0.2									5.0	
Carson City	4,720	82	92	25.27	30.15	— .01	35.2	+ 3.3	58	12	45	3	1	26	36	31	26	74	2.14	— 0.4	11	5,489	s.	61	sw.	2	10	11	10	5.6	7.2
Winnemucca	4,344	59	70	25.69	30.19	+ .01	32.1	+ 5.1	53	14	41	— 5	10	23	32	29	23	68	1.31	+ 0.2	9	8,340	ne.	53	s.	4	8	9	14	6.5	4.5
Modena	5,479	10	38	24.63	30.26	.....	31.0	.....	58	13	44	— 8	1	18	40	25	18	65	0.43	.....	6	6,388	w.	38	sw.	7	13	10	8	4.1	0.9
Salt Lake City	4,366	105	110	25.68	30.23	.00	33.5	+ 5.6	51	13	41	4	1	26	25	29	23	69	0.95	— 0.5	5	3,780	se.	40	nw.	7	16	3	12	4.7	4.7
Grand Junction	4,608	43	50	25.47	30.32	.....	28.4	+ 2.5	54	7	40	0	3	16	37	22	14	61	0.45	— 0.2	5	3,049	nw.	30	s.	7	18	2	11	4.2	3.7
Northern Plateau.							31.3	+ 6.5										60	1.46	— 0.7									7.0	
Baker City	3,471	53	58	26.45	30.16	— .03	29.7	+ 6.9	48	14	37	1	1	23	23	27	22	74	0.80	— 0.8	12	4,857	s.	32	sw.	14	8	5	18	6.3	5.6
Boise	2,739	61	68	27.23	30.18	— .05	34.8	+ 7.4	53	14	42	10	1	28	19	32	27	72	1.56	— 0.8	12	3,840	se.	25	e.	4	6	11	14	6.6	4.2
Lewiston	770	52	61	.....	.....	.....	35.4	.....	54	12	42	17	10	29	22	...	...	...	0.94	.....	10	2,684	e.	36	nw.	4	6	9	16	6.5	5.9
Pocatello	4,482	48	56	25.51	30.21	— .02	29.2	+10.1	47	14	36	—13	1	22	30	26	23	77	0.53	— 1.5	10	9,858	s.	40	s.	2	9	1	21	7.1	3.7
Spokane	1,943	99	107	27.98	30.12	+ .01	30.0	+ 5.5	50	27	36	10	10	24	19	28	26	85	2.29	— 0.2	15	4,462	sw.	30	sw.	13	2	8	21	8.1	12.9
Walla Walla	1,000	65	73	29.00	30.11	— .03	33.0	+ 2.5	59	12	38	11	10	28	24	32	31	91	2.11	— 0.3	10	4,009	s.	30	s.	2	2	6	23	7.5	10.5
N. Pac. Coast Reg.							33.3	+ 0.4										86	7.10	— 0.1									7.5	
Neah Bay	50	7	52	29.90	29.96	— .04	39.6	— 1.1	53	12	43	29	4	36	14	40	38	93	13.78	— 1.5	23	6,015	e.	36	sw.	12	7	1	23	8.2	14.5
Port Crescent	259	14	20	.....	.....	.....	36.4	+ 0.9	54	12	41	23	9	32	21	....	....	....	5.30	— 1.8	21	2,480	sw.	48	sw.	15	4	6	21	7.8	8.0
Seattle	123	114	121	29.89	30.02	— .01	40.2	+ 1.2	54	12	44	28	9	36	18	39	36	86	4.26	— 0.3	18	4,509	se.	30	se.	12	2	9	20	7.8	13.1
Tacoma	213	113	120	.....	.....	.....	39.3	+ 1.3	54	12	44	27	1	35	19	....	....	---	6.48	+ 0.1	19	4,647	s.	27	sw.	15	3	7	21	7.8	11.6
Astoria	20	57	64	.....	.....	.....	40.9	+ 0.4	54	12	46	30	9	36	17	....	....	....	10.84	+ 0.1	22	.....	e.	....	.....	...	5	10	16	6.9	
Portland, Oreg	154	208	213	29.89	30.06	— .03	39.5	+ 1.1	57	12	45	26	1	34	18	38	36	85	7.80	+ 0.7	18	6,992	s.	52	s	12	7	5	19	7.3	15.7
Roseburg	518	56	67	29.49	30.07	— .05	39.4	— 0.9	59	12	44	24	1	34	18	38	36	89	8.35	+ 2.2	17	2,298	s.	24	sw.	7	6	6	19	6.9	T.
Mid. Pac. C'st Reg.							47.4	+ 0.3										81	6.55	+ 1.0									5.6	
Eureka	62	60	69	30.01	30.07	— .02	47.4	+ 1.1	62	17	53	33	9	42	24	45	43	85	9.93	+ 1.4	18	5,001	se.	43	nw.	24	10	8	13	5.7	
Mount Tamalpais	2,375	11	18	27.56	30.09	— .02	43.4	.....	57	27	48	31	10	39	19	40	36	80	5.74	.....	13	14,519	nw.	.....	.....	...	13	7	11	5.1	T.
Red Bluff	332	50	56	29.73	30.10	— .03	44.4	— 0.5	69	27	52	25	1	37	25	42	38	81	6.60	+ 1.9	12	4,917	n.	37	n.	31	16	4	11	4.8	5.0
Sacramento	69	106	117	30.01	30.09	— .03	45.0	— 0.6	57	29	51	26	1	39	20	43	40	82	3.70	— 0.1	13	6,243	se.	60	se.	3	6	10	15	6.5	
San Francisco	155	161	167	29.98	30.09	— .02	49.8	— 0.3	62	27	55	37	1	45	16	47	43	77	5.79	+ 1.0	11	5,560	n.	57	se.	3	11	8	12	5.3	
Point Reyes Light	.....	12	16	.....	.....	.....	50.3	+ 1.7	72	16	56	37	10	45	30	....	....	....	6.72	+ 0.7	12	8,366	se.	72	nw.	24	10	8	13	6.0	
S. Pac. Coast Reg.							52.8	+ 2.2										71	4.48	+ 1.8									5.0	
Fresno	330	67	70	29.73	30.09	—.04	47.8	+ 3.3	67	19	54	28	1	41	31	45	42	82	2.16	+ 0.8	9	3,320	nw.	20	w.	25	5	8	18	7.2	
Los Angeles	338	74	82	29.70	30.06	.00	55.0	+ 1.9	78	18	64	36	1	46	32	48	41	66	2.49	— 0.4	8	3,208	ne.	18	e.	20	10	14	7	4.9	
San Diego	87	94	102	29.94	30.04	— .03	56.2	+ 2.6	75	18	63	40	11	50	21	49	42	65	2.08	+ 0.1	7	3,876	nw.	24	s.	20	21	3	7	3.2	
San Luis Obispo	201	10	46	29.88	30.10	+ .01	52.2	+ 1.1	72	19	62	22	2	42	37	47	42	72	11.21	+ 6.6	9	4,510	n.	25	n.	15	14	10	7	4.6	
West Indies.																														
Basseterre	29	41	54	29.96	30.01	.....	77.3	.....	85	16	82	68	10	72	15	71	68	75	3.31	.....	14	7,030	ne.	25	e.	10	11	15	5	4.7	
Bridgetown	30	57	65	29.94	29.98	.....	77.8	.....	86	9	84	68	27	72	16	72	70	75	2.36	— 0.3	10	6,234	e.	24	se.	24	16	12	3	4.0	
Cienfuegos	52	62	67	30.00	30.05	.....	69.9	.....	86	1	80	50	29	60	28	63	61	81	1.84	.....	5	5,527	ne.	25	ne.	19	19	11	1	3.0	
Grand Turk	11	6	20	.....	.....	.....	74.7	.....	84	17	81	61	26	68	21	....	....	....	1.84	.....	9	.....	ne.	.....	.....	...	4	15	12	6.4	
Havana	57	87	105	30.01	30.07	.....	70.1	.....	85	1	76	50	27	64	24	64	61	77	8.44	+ 5.7	9	8,734	e.	40	nw.	18	12	12	7	4.5	
Kingston	286	38	52	29.68	29.99	.....	75.0	.....	87	11	84	61	28	66	21	67	64	76	3.00	.....	7	4,411	ne.	21	se.	17	17	11	3	3.6	
Port of Spain	40	65	66	29.91	29.95	.....	78.2	.....	88	8	86	66	27	71	20	72	69	77	2.26	.....	9	3,675	e.	16	se.	24	5	16	10	6.1	
Puerto Principe	352	55	62	29.69	30.04	.....	69.7	.....	86	4	80	47	27	59	35	63	61	80	0.92	.....	3	5,024	ne.	28	ne.	20	18	10	3	3.2	
Roseau	25	37	47	29.95	29.97	.....	77.8	.....	88	8	84	69	7	72	16	71	68	74	3.53	.....	11	4,017	e.	21	e.	12	16	12	3	3.9	
San Juan	82	48	90	29.94	30.02	.....	75.8	.....	84	23	82	67	28	70	15	70	67	76	4.36	+ 1.4	14	7,797	e.	34	e.	20	17	12	2	3.3	
Santiago de Cuba	82	26	31	29.92	30.00	.....	75.4	.....	89	2	85	57	27	66	24	66	64	76	3.46	.....	4	3,217	ne.	20	ne.	20	18	8	5	3.5	
Santo Domingo	57	37	44	29.97	30.03	.....	75.1	.....	86	29	83	64	13	67	20	69	68	84	1.54	.....	8	4,404	n.	16	n.	27	17	13	1	3.5	
Willemstad	75	39	46	29.85	29.92	.....	78.6	.....	85	24	83	70	21	74	12	73	71	81	2.23	.....	10	7,700	e.	27	e.	18	19	16	3	4.2	

NOTE.—The data at stations having no departures are not used in computing the district averages.

TABLE II.—*Climatological record of voluntary and other cooperating observers, January, 1901.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Ashville	67	23	43.2	5.73	
Benton				5.42	
Bermuda	75	24	49.6	3.22	
Birmingham	68	25	48.6	5.00	
Bridgeport				6.55	
Burkville				5.40	
Calera				6.59	
Camp Hill	72	24	48.0	3.90	
Citronelle	73	29	52.8	5.53	
Clanton	69	25[e]	46.4[e]	7.32	
Daphne	74[e]	31[e]	52.8[e]	2.74	
Decatur	69	19	43.0	5.47	
Demopolis				4.01	
Elba	73	20	49.2	4.43	
Eufaula[a]	75	24	47.2	4.28	
Eufaula[c]				4.54	
Eutaw	70	27	47.4	3.26	
Evergreen	70	25	48.4	5.39	
Florence[a]				5.71	
Florence[b]	68	20	43.2	5.66	
Gadsden	70	22	44.8	5.56	
Goodwater	68	22	45.0	7.11	
Greensboro	72	28	47.9	4.34	
Greenville				5.33	
Healing Springs	75	23	48.4	4.89	
Helena				5.05	
Highland Home	70	27	49.8	4.79	
Letohatchee				4.08	
Livingston[a]	70	21	46.8	2.26	
Lock No. 4	66	23	42.8	11.72	
Madison Station	68	20	42.5	5.77	
Maplegrove	69	21	40.6	8.59	
Marion	72	25	50.8	4 20	
Mount Willing	70	27	49.8	6.09	
Newbern	70	25	47.8	3.71	
Newburg	65			5.03	
Newton	70	25	46.7	4.52	
Notasulga				5.53	
Oneonto	70	21	43.1	6.76	T.
Opelika	65	28	45.7	9.59	
Oxanna	70	24	46.2	4.64	T.
Pineapple	73	23	49.9	4.75	
Prattville	72	24	49.5		
Pushmataha	72	27	49.6	4.75	T.
Riverton	70	20	40.8	5.60	T.
Scottsboro	65	20	40.3	4.95	T.
Selma	74			2.74	
Talladega	69	20	44.9	5.62	
Tallassee				6.44	
Thomasville	72	28	48.5	3.25	
Tuscaloosa	68	24	45.0	4.67	
Tuskegee	71	21	47.6	5.45	
Union Springs	70[b]	27[b]	47.7[b]	4.85	
Uniontown	73	27	49.0	5.28	
Valleyhead	67	19	41.2	5.03	
Verbena				5.42	
Wetumpka	71	25	47.5	5.07	
Arizona.					
Allaire Ranch				1.00	
Arivaca	74	25	49.9	1.55	
Arizona Canal Co. Dam	75	26	52.8	1.05	
Aztec[*1]	76	27	55.3	0.21	
Benson[*1]	73	25	47.6	0.74	
Bisbee	69	22	46.5	1.72	
Buckeye	79	18	53.4	0.80	
Camp Creek	68	25	49.9	1.45	
Casagrande[*1]	74	34	56.1	0.84	
Champie Camp	80	20	54.2	1.70	
Cochise[*1]	72	26	42.0	0.69	
Congress	70	28	52.7	0.91	
Dragoon Summit[*1]	55	23	42.2	0.69	
Dudleyville	75	15	49.3	2.58	
Fort Apache	60	9	41.2	2.87	T.
Fort Defiance	54	— 6	29.9	1.40	T.
Fort Grant	79	19	49.6	2.05	
Fort Huachuca	72	20	48.2	1.70	
Fort Mohave	78[d]	23[d]	51.8[d]	0.35	
Gilabend[*1]	71	28	51.0	0.15	
Ingleside	78	22	52.6	0.59	
Jerome	60	19	44.0	1.10	
Maricopa[*1]	70	20	44.2	0.75	
Mesa	75	28	52.4	0.63	
Mohawk Summit[*1]	77	35	56.3	0.10	
Mount Huachuca	70	23	47.3	2.85	
Oracle	65	20	47.0	3.26	
Oro				1.64	
Pantano[*1]	75	30	52.2	2.30	
Parker	78	16	51.7	0.20	
Peoria	76	24	52.2	0.50	
Phoenix	78	20	52.0	0.42	
Pima	73	15	46.6	1.43	
Pinal Ranch				4.01	
Prescott	64	1	42.4	1.10	
Russellville				1.79	
San Carlos	75	15	47.2	2.05	
Sentinel[*1]	82	31	56.9	0.33	
Showlow				2.52	T.
Signal	80	10	48.6	0.40	
Silverking				3.24	
Strawberry	61	0	37.0	3.14	1.0
Supai	68	15	41.1	0.39	T.
Tombstone	70	19	48.1	0.89	
Tonto	68	16	46.2	2.48	
Tuba	57	3	34.0	0.83	
Tucson	76	19	51.0	1.15	
Vail[*5]	74	30	52.8	0.16	
Walnut Grove				0.02	
Willcox[*1]	65	15	36.9	1.75	
Yarnell				1.30	
Arkansas.					
Amity	71	20	46.2	1.50	T.
Arkadelphia	73	21	48.2	2.54	T.
Arkansas City				1.21	
Batesville	74	19	44.8	2.63	
Beebranch	78[c]	17[c]	45.8[c]	1.60	
Blanchard Springs	73	21	48.4	3.15	
Brinkley	72	22	45.9	2.54	T.
Camden[a]				4.40	
Camden[b]	73	24	49.2	4.10	
Conway	73	19	47.6	1.21	
Corning	69	18	40.1	0.92	T.
Dallas				1.58	
Dardanelle				1.13	
Elon	76	21	48.2	4.89	T.
Fayetteville	69	11	40.8	1.05	T.
Fulton				2.36	
Hardy	68	16	41.8	1.02	0 2
Helena[a]				2.77	
Helena[b]	71	23	47.0	2.53	T.
Hot Springs[b]				1.82	
Jonesboro	70	21	45.6	1.80	
Keesees Ferry	72	12	42 8	1.10	0.1
Lacrosse	70	15	43.0	1.51	
Lonoke	73	20	46.8	2.73	T.
Lutherville	70	18	44.5	1.42	T.
Marianna	70	21	44.9	2.85	T.
Marvell	71	22	51.8	2.54	T.
Mossville	65	7	41.0	0 85	T.
Mount Nebo	65	19	42.4	2.17	T.
New Gascony	70	24	47.8	3.44	T.
Newport[a]				2 55	T.
Newport[b]	70	20	45.0	3.42	
Newport[c]	71	20	43.6	2.79	T.
Oregon	70	11	41.6	1.00	
Osceola	73	20	45.0	3.06	
Ozark	71	19	45.8	1.13	T.
Pinebluff	73	21	48.0	3.59	
Pocahontas	64	17	38.4	1.13	
Pond	65	10	40 3	0.76	T.
Prescott	72	23	48.8	2.32	
Rison	78	19	52.3	3.82	
Rosadale	71	21	49.0	0.82	
Russellville	68	21	45.1	1.71	
Silversprings	72	11	41.8	0.97	T.
Spielerville	73	19	45.9	1.50	T.
Stuttgart	72	21	46.6	2.97	T.
Texarkana	74[i]	20[i]	48.7[i]	2.17	
Warren	74	22	48.2	4.06	
Washington	71	24	49.0	2.41	
Wiggs	69	19	45.9	1.94	T.
Winchester	72	13	45.5	3.64	
Winslow	70	7	40.6	2.04	
Witts Springs	68[d]	9[d]	42.7[d]	1.95	T.
California.					
Angiola	70	15	46.0	2.71	
Bear Valley				14.91	45.0
Berkeley	59	32	48.8	5.86	
Bishop	57	6	36.3	4.89	11.5
Boca[*5]	52	−26	24.6	7.17	43.5
Bodie	44	−26	15.7	7.39	73.0
Bowman				14.30	63.0
Branscomb				21.13	1 0
Campbell	64	25	49.0	3 81	
Cedarville	50	−13	29.6	2 15	24.5
Chico[*1]	70	28	47.6	4.60	
Cisco[*1]	42	3	29.1	10.95	92.0
Claremont	72	22	49.4	4.48	
Corning[*1]	64	26	46.6	6.09	1.5
Craftonville	77	27	50.6	2.60	
Crescent City	70	30	46.2	10.67	
Cuyamaca[*5]	54	11	36.1	8.17	1.0
Delano[*1]	67	24	48.8	1.79	
Delta[*1]	63	26	41.6	13.43	55.0
Drytown	63	23	45.6	4.73	
Dunnigan[*1]	60	25	45.6	5.04	
Durham[*1]	60	25	44.8	4.65	
Edmanton[*1]	51	7	32.1	16.79	104.0
Elcajon	82	28	53.2	1.80	
Elmdale	66	26	46.0	1.85	
Elsinore	81	20	51.2	3.59	
Escondido	70	14	48.0	2.86	
Fallbrook	74	29	51.2	4.24	
Fordyce Dam				11.22	95.0
Fort Ross	67	35	50.6	7.70	
Fort Tejon				1.81	
Georgetown	64	19	43.0	10.40	0.5
Gilroy (near)	73	23	50.6	1.92	
Glendora				4.03	
Goshen				3.77	
Grand Island[*5]	60	30	46.6	3.70	
Grass Valley				13.15	3.0
Greenville	59	— 7	32.2	8.09	76.0
Hanford	67	25	45.0	3.15	
Healdsburg	66	24	47.0	9.46	
Hollister	67	19	48.8	2.27	
Indio[*1]	76	23	51.0	0.29	
Iowa Hill[*1]	63	27	44.5	9.94	1.2
Irvine	84	32	58.5	3.64	
Jackson (near)	62	20	42.2	7.13	0.5
Jolon				4.84	
Keene[*1]	62	27	43.6	0.89	
Kent				9.08	
Kernville				1.35	
Kingsburg[*1]	67	29	50 8	0.25	
Kono Tayee	62	30	45.2	5.57	T.
Lamesa				2.82	
Laporte[*1]	48	8	31.9	17.25	98.5
Las Fuentes Ranch				4.37	
Legrand	65	25	45.5	2.49	
Lemoncove	70	28	48.4	5.42	
Lemoore[*1]	64	34	46.4	2.27	
Lick Observatory	60	30	39.7	5.76	2.6
Lodi	58	28	46.0	2.42	
Los Gatos[b]	65	30	49.1	8.96	
Mammoth[*1]	75	30	54.0	0.50	
Manzana	63	30	44.6	3.20	T.
Merced[b]	65	24	46.1	1.50	
Mills College				6.08	
Milo				6.00	3.0
Milton (near)				2.63	
Modesto[*1]	75	31	51.0	1.55	
Mohave[*1]	60	20	44.2	0.73	
Mokelumne Hill[*3]		27	43.2	6.04	
Monterio	68	22	45.8	3.81	
Monterey[*1]	69	25	52.2	2.48	
Morena	68	20	45.8	2.25	
Mountainview				2.49	
Mutah				7.00	
Napa	63	25	46.0	4.86	
Needles	75	30	48.4	0.00	
Nevada City	64	17	41.2	11.52	
Newhall[*1]	72	17	46.4	5.13	
Niles[*1]	66	34	52.5	3.31	
North Bloomfield	69	18	42 0	7.73	5.0
North Ontario	70	26	49.9	5.33	
North San Juan[*1]	61	18	43.2	11.97	2.0
Oakland	61	32	49.5	6.44	
Ogilby[*1]	77	35	53.0	0.19	
Oleta[*1]	62	24	43 3	6.13	T.
Orland[*1]	65	24	44.2	4.20	1 0
Palermo	63	20	45.0	5.23	
Paso Robles[b]	68	17	46.6	6.11	
Peachland[*5]	64	26	47.0	8.16	
Pilot Creek				14.26	19.0
Pine Crest	72	39	54.5	5.82	
Placerville	60	16	43.0	9.95	
Point Lobos	59	38	49.2	5.35	
Pomona (near)	76	25	51.0	2.89	
Poway[*5]	77	28	53.2	2.28	
Quincy	48	−11	31.0	11.03	46.2
Ranch House				3.38	
Raymond				7.49	
Redding	70	26	44.0	6.33	8.2
Redlands	74	26	51.0	2.25	
Reedly	71	26	48.2		
Represa	62	28	47.2	5.01	
Riovista	59	26	45.3	3.61	
Riverside	76	33	53.1	2.67	
Rosewood	69	16	40.9	9.17	11.5
Sacramento	59	25	45.6	4.18	
Salinas[*1]	60	28	50.8	1.69	
Salton[*1]	77	31	50.8	0.20	
San Bernardino	79	18	50.6	3.48	
San Jacinto	71	24	48.8	2.86	
San Leandro[*5]	63	27	47.4	4.42	
San Mateo[*1]	58	29	47.2	3.95	
San Miguel[*1]	64	18	46.2	3.12	
Santa Barbara	75	35	54.6	4.86	
Santa Clara				3.41	
Santa Cruz	71	23	49.0	4.30	
Santa Maria	72	29	54.0	4.51	
Santa Monica	71	37	52.0	3.34	
Santa Rosa[*1]	63	23	48.4	6.05	
Shasta	79	26	44.6	13.65	25.0
Sierra Madre	74	34	52.8	4.84	
Snedden				3.70	
Sonoma				5.92	
Stanford University	60	26	47.6	2.48	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Stockton	58	32	41.9	1.89	
Storey	62	28	45.6	2.66	
Summerdale	63	11	37.1	24.46	20.0
Susanville	46	− 8	28.2	4.76	40.0
Tehama [1]	62	31	45.5	6.01	1.0
Tejon Ranch	76	28	54.6	1.28	
Templeton [1]	70	23	45.3	9.10	
Thermalito	62	25	45.2	6.80	
Truckee [1]	42	−18	24.1	5.00	50.0
Tulare *b*				3.20	
Tulare *c*	74	22	48.0	3.27	
Ukiah	68	19	44.4	11.52	
Upperlake	75	25	45.2	6.44	0.5
Upper Mattole [1]	72	28	44.8	18.11	
Vacaville [1]	62	27	46.1	4.68	
Ventura	75	35	55.4	4.21	
Visalia *b*	70	21	47.4	4.18	
Volcano Springs [1]	79	24	53.5	0.59	
Wasco	69	20	47.0	1.00	
Westpoint				7.66	1.5
West Saticoy				4.35	
Wheatland	58	23	44.2	5.46	
Williams [1]	65	31	49.0	3.45	
Wilmington [1]	78	38	49.4	3.02	
Wire Bridge [5]	63	21	44.2	7.16	
Yreka	46	2	27.2	8.12	74.0
Yuba City [5]	62	27	48.0	4.82	
Colorado.					
Alford	60	−30	28.6	0.29	3.5
Antelope Springs	45	−45	10.2	1.13	17.0
Arkins				0.21	3.0
Blaine	83	−17	36.7	0.23	3.4
Boulder	69	− 8	36.4	0.53	7.5
Boxelder				0.19	2.0
Breckenridge	39	−30	9.1	2.36	38.2
Buenavista				0.25	4.0
Canyon	65	−24	36.8	0.37	5.0
Castlerock	59	−22	31.2	0.25	3.0
Cedaredge	56	− 7	28.6	0.79	3.2
Cheyenne Wells	64	−17	30.0	0.15	1.0
Clearview	48	−17	24.9	0.81	13.0
Collbran	48	−15	22.4	0.88	14.2
Colorado Springs	62	−19	33.0	0.06	1.5
Cope	60	−15	30.0	0.07	1.0
Crook	72	−17	29.9	0.00	
Delta	60	−10	27.8	0.57	5.0
Dumont				0.45	7.0
Durango	55	−15	24.2	0.44	7.0
Fort Collins	62	−22	28.7	0.19	2.0
Fort Morgan	59	−23	26.4	0.05	0.8
Fox				0.05	0.5
Gilman				2.15	37.0
Gleneyrie	58	−13	33.3	0.33	3.8
Greeley	60	−24	27.0	0.22	3.5
Grover				T.	T.
Gunnison	38	−33	14.4	0.38	5.9
Hamps	68	−24	29.2	0.34	5.5
Hoehne	67	−29	33.6	0.13	2.0
Holly	69	−12	32.2	0.20	2.0
Holyoke (near)	70	−22	26.8	0.00	
Hugo				0.18	3.0
Husted	62	−24	29.4	0.25	4.5
Lake Moraine	48	−15	23.5	1.05	13.8
Lamar	73	−17	32.3	0.40	4.0
Laporte				0.05	1.0
Las Animas	70	−20	31.6	0.28	3.0
Lay	47	−24	20.0	0.70	11.5
Leadville (near) [1]	42	−16	16.1	1.02	14.8
Leroy	62	−13	29.8	0.06	0.8
Longs Peak	48	−20	23.4	0.69	11.0
Mancos	51	−10	27.6	2.20	4.0
Marshall Pass				1.55	24.0
Meeker	48	−18	23.6	0.81	9.2
Mitchell				1.07	16.0
Montrose				0.54	5.5
Moraine	45	−15	23.9	0.61	9.5
Pagoda	49	−24	21.6	0.74	10.0
Parachute	49	− 8	23.9	1.07	10.0
Perrypark				1.47	16.0
Rangely	42	−18	16.7	0.40	6.8
Rockyford	70	−22	41.1	0.30	2.5
Rogers Mesa	55	− 5	28.0	0.39	3.4
Ruby				4.12	64.0
Saguache	59	−12	24.0	0.07	1.0
Salida	60	−16	29.2	0.01	0.2
San Luis	56	−16	24.7	0.43	2.0
Santa Clara	56	−10	30.0	0.46	7.2
Sapinero				0.55	10.5
Sargents				0.76	12.0
Seibert				0.15	2.0
Silt	51	− 9	25.2	1.08	15.5
Springfield				0.25	4.0
Sugarloaf	54	−15	27.0	0.84	13.0
Telluride	52	−20	23.6	1.30	20.1
Trinidad	72	−15	38.2	0.11	2.0
T. S. Ranch	50	0	28.0	0.46	2.2

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.	
Colorado—Cont'd.	°	°	°	*Ins.*	*Ins.*	
Twinlakes				0.82	13.0	
Vilas				0.20	3.0	
Wagon Wheel	42	−37	8.9	0.97	15.0	
Walden	44	−25	18.7	0.14	3.2	
Wallet				0.06	1.0	
Westcliffe	52	−15	25.0	1.55	14.6	
Wray	68	−19	29.8	T.	T.	
Yuma				T.	T.	
Connecticut.						
Bridgeport	51	− 2	28.8	2.12	6.1	
Canton	48	−10	24.3	1.54	5.5	
Colchester	48	− 7	26.4	1.83	6.0	
Falls Village				1.48	6.9	
Hartford *b*	46	− 2	26.8	1.91	6.0	
Hawleyville	49	− 7	26.6	1.89	6.0	
Lake Konomoc				2.45		
Middletown	52	− 7	26.9	1.74	8.2	
New London	49	9	28.6	1.55	6.2	
North Grosvenor Dale	50	− 9	23.7	2.01		
Norwalk	51	− 6	27.1	1.81	6.8	
Southington	48	− 6	26.6	1.60	8.8	
Storrs	46	− 8	24.3	2.17	8.5	
Voluntown	48	− 7	25.0	2.24	5.5	
Wallingford				1.93	1.0	
Waterbury	49	− 5	26.9	1.78	4.5	
West Cornwall	46	− 9	23.5	1.52	5.4	
West Simsbury				1.41	5.5	
Delaware.						
Milford	68	11	34.9	3.11		
Millsboro	64	6	33.2	3.05	2.0	
Newark	56	8	30.8	2.54	10.0	
Seaford	60	11	35.0	3.44	5.0	
Wyoming				2.58	5.0	
District of Columbia.						
Distributing Reservoir [5]	60	15	34.3	2.38		
Receiving Reservoir [5]	60	12	33.8	2.62		
West Washington	69	12	33.7	2.99	7.3	
Florida.						
Archer	81	26	54.8	3.11		
Bartow	83	30	59.2	1.07		
Brooksville	79	32	55.8	2.04		
Carrabelle	72	30	54.2	2.92		
Clermont	84	35	58.4	1.03		
Dalkeith	76	26	53.2	4.54		
De Funiak Springs	74	25	52.6	3.87		
Deland	85	25	56.9			
Earnestville	82	36	59 0	2.75		
Eustis	86	33	59.5	1.42		
Federal Point	79	29	55.4	2.97		
Fort George [1]	76	38	54.6			
Fort Meade	83	29	60.0	1.16		
Fort Pierce	83	34	63.0			
Gainesville	84	27	57.6	2.69		
Huntington	81	27	56.7	2.19		
Hypoluxo	91	41	67.1	9.62		
Inverness	83	25	55.7	1.67		
Jasper [f]	82	27	53.5	3.83		
Kissimmee	81	31	61.4	0.92		
Lake Butler	82	25	54 8	1.52		
Lake City	80	25	54.7	3.95		
McAlpin	85	25	54.6	4.20		
Macclenny [5]	77	23	53 0	3.63		
Manatee	89	36	58.9	1.94		
Marco	87	42	65.5	0.25		
Marianna	76	25	51.3			
Merritt Island	82	40	61.3	1.10		
Micanopy	82	25	55.6	3.13		
Middleburg	80	22	51.9	3.21		
Myers	84	39	60.8	0.50		
Nocatee	83	31	60.6	1.08		
Ocala	87	26	57.0	2.09		
Orange City	85	27	58.4	1.50		
Orlando	82	35	60.0	1.07		
Plant City	85	28	59.2	1.07		
Rockwell	88	27	58.0	2.15		
St. Augustine	79	32	56.8	1.58		
St. Francis	84	24	57.4	1.31		
Sebastian	81	38	60.6	2.86		
Stephensville [1]	79	27	52.4	2.69		
Sumner	88	22	55.8	2.40		
Switzerland [1]	79	32	52.6	2.28		
Tallahassee	74	29	52.1	3.46		
Wausau [5]	73	26	53.2			
Georgia.						
Adairsville	63	22	43.6	6.67		
Albany	77	30	51.5	4.77		
Allapaha	74	26	49.0	5.22		
Allentown	72	24	48.4	3.96		
Americus	71	25	46.2	4.70		
Athens *b*	67	23	42.6	4.14		
Auburn	66	22	44.0	5.85		
Blakely	73	30	50.6	4.48		
Brent	71	22	46.6	2.52		
Canton				6.44		
Carlton				3.67		
Clayton	61	18	40.2	5.09	T.	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.	
Georgia—Cont'd.	°	°	°	*Ins.*	*Ins.*	
Columbus	69 [f]	28 [f]	46.1 [f]	3.84		
Covington	68 [e]	22 [e]	44.0 [e]	3.89		
Dahlonega	64	13	39.6	6.34	T.	
Diamond	61	15	39.6	7.25	T.	
Dublin				4.06		
Elberton	67	24	45.8	4.16		
Experiment	67	25	46.4	4.77	T	
Fitzgerald	78	24	48.9	3.33		
Fleming	78	24	49.7	4.62		
Fort Gaines	72	27	48.6	4.22		
Franklin	76	26	46.8	5.83		
Gainesville	61	23	41.6	8.02		
Gillsville	66	21	44.2	6.44		
Greenbush	63	19	41.4	6.79		
Harrison	72	25	48.4	3.51		
Hawkinsville	72	27	47.1	4.61		
Hephzibah	72	28	47.9	5.00		
Jesup	77	27	49.9	4.73		
Louisville	79	25	46.8			
Lumpkin	72	28	49.4	4.35		
Marshallville	74	28	49.6	4.53		
Mauzy	75	21	51.4	5.56		
Millen	75	25	48.8	3.16		
Monticello				3.67		
Morgan	73	20	48.2	3.48		
Naylor	80	23	51.0	5.80		
Newnan	65	24	42.7	6.10		
Oakdale				6.28		
Piscola	75	27	51.4	2.83		
Point Peter	69	22	43.2	4.08		
Poulan	76 [d]	22 [e]	49.2 [e]	3.94		
Putnam	71 [i]	28 [i]	49.5 [i]	3.49		
Quitman	81	22	50.4	4.78		
Ramsey	65	18	42 1	6.48		
Resaca				6.14		
Rome	66	22	42.2	7.35		
Statesboro	73 [e]	25 [e]	48.2 [e]	3.14		
Talbotton	71	24	47.3	3.27		
Tallapoosa	64	22	43.8	5.70		
Thomasville	74	25	51.2	4.90		
Toccoa		19		6.67		
Valona	74	27	51.5	5.31		
Vidalia	75	27	48.9	3.96		
Washington				3.37		
Waycross	77	29	50.0	4.53		
Waynesboro	73	21	44.7	3.12		
Westpoint	68	25	46.7	5.47		
Woodbury				6.06		
Idaho.						
Albion	53	−22	28.0	1.11	4.0	
American Falls	51	− 2	27.6	0.94		
Atlanta	41	− 8	22.6	3.84	48.0	
Blackfoot	48	−21	25.8	0.30	0.5	
Burnside	37	−15 [h]	18.1 [d]	1.40	13.0	
Challis	52	−12	24.7	1.18	10.0	
Chesterfield	44	−20	18.0	0.91	8.0	
Downey	45	5	29.6	0.90	T.	
Forney	48	−18	21.4	1.53	13.5	
Garnet	55	11	35.6	0.54	T.	
Hagerman	54	3	33.7	0.74	0.3	
Halley				4.17	42.5	
Kootenai	42	1	19.8	3.93	37.0	
Lake	40	−12	19.0	2.60	26.0	
Lakeview	48	6	29.0	3.51	22.0	
Lost River	40	−23	14.6	1.54	17.0	
Moscow	46	7	28.7	2.93		
Murray	43	6	25.8	4.65	27.0	
Oakley	56	− 1	31.0	0. 5	2.0	
Ola	45	6	31.3	2 82	14.3	
Paris	50	−11	20.3	0.66		
Payette	48	19	32.8	1.13	4.5	
Pollock	50	7	35.0	2.27	6.0	
Priest River	46	9	27.0	3.02	24.2	
St. Maries	48	10	30.2	3.41	22.5	
Soldier	41	−20	16.6	2.44	25.5	
Swan Valley	49	−22	21.9	0.47	4.3	
Weston	43	− 1	27.0	0.94	3.0	
Illinois.						
Albion	63	9	34.8	1.31	0.5	
Aledo	55	− 4	27.4	1.44		
Alexander	63	− 5	31.6	2.33	1.2	
Ashton	52	−12	23.6	0.91	8.4	
Astoria	58	− 3	30.2	2.30	1.8	
Aurora *a*	53	−10	23.9	1.39	8.1	
Bloomington	59	− 5	29.0	1.70	1.8	
Bushnell	58	0	29.2	0.87	1.5	
Cambridge	55	− 5	26.0	1.37	7.5	
Carlinville	65	− 5	32.8	1.70		
Carlyle				0.72		
Centralia		8		1.28	0.5	
Charleston	64	− 2	31.2	1.39	3.0	
Chemung	49	−14	20.7	1.43	14.5	
Chester				1.00	0.6	
Cisne	67	9	35.9	1.08	T.	
Coatsburg	57	− 4	29.8	1.70	T.	
Cobden	65	11	38.6	1.34		

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Illinois—Cont'd.	°	°	°	*Ins.*	*Ins.*
Danville	57	— 4	28.8	1.36	0.8
Decatur	63	— 6	30.6	1.78	3.9
Dixon	54	— 9	24.9	1.09	7.0
Dwight	54	— 9	26.2	1.60	7.0
Effingham	62	3	34.0	1.38	2.0
Equality	66	13	38.4	0.65	T.
Flora	64	7	34.8	0.86	0.4
Friendgrove*[b]	66	10	36.8	1.60	.....
Galva	56	— 5	26.2	1.13	4.0
Grafton	.....	.....	.....	1.78	0.5
Grayville	62	14	36.6	1.82	1.0
Greenville	67	4	34.4	1.40	1.0
Griggsville	63	0	32.0	2.06	2.2
Halfway	64	11	37.6	1.37	T.
Halliday	66	11	38 1	1.25	.....
Havana	61	— 2	31.0	2.54	2.0
Henry	57	— 5	27.8	1.45	8.8
Hillsboro	62	0	32.2	1.92	0.7
Joliet	54	—12	24.8	1.88	8.2
Kishwaukee	51	—15	22.6	1.41	11.0
Knoxville	56	— 7	26.6	1.11	2.0
Lagrange	55	—12	24.2	1.45	8.5
Lanarpe	57	— 1	29.0	1.17	1.0
Lanark	46	—17	22.4	0.90	11 0
Loami	.....	.....	.....	1.87	2.0
McLeansboro	64	11	36.2	1.41	.....
Martinsville	60	4	32.2	0.57	3.5
Martinton	59	—13	27.4	1.55	5.0
Mascoutah	62	8	34.4	1.61	0.7
Mattoon	62	6	34 6	1.85	2.4
Minonk	54	— 7	27.2	1.49	2.8
Monmouth	55	— 4	26.6	1.34	3.8
Monticello	62	— 5	30.6	2.14	2.0
Morgan Park	.....	.....	.....	0.79	8.5
Morrisonville	62	— 3	31.6	1.52	0.8
Mount Carmel	.....	.....	.....	1.61	0.5
Mount Pulaski	62	— 2	30.4	1.96	2.0
Mount Vernon	65	8	33.5	1.37	.....
New Burnside	66	13	38.0	1.01	T.
Olney	64	9	34.8	1.00	1.4
Ottawa	56	— 3	28.4	1.76	10.3
Palestine	61	7	32.6	1.03	0.8
Pana	63	7	32.7	1.64	0.5
Paris	60	0	30.7	1.48	.....
Peoria*[a]	.....	.....	.....	2.00	3.0
Peoria*[b]	54	1	29.3	1.98	1.0
Philo	60	— 8	28.6	2.01	4.0
Plumhill	64	9	35.9	1.39	T.
Rantoul	60	— 7	28.8	1.57	2.1
Raum	64	10	38.1	1.66	T.
Riley	46	—13	21.6	1.38	10.9
Robinson	62	6	33.1	1.09	1.6
Round Grove	44	— 9	20.6	0.82	8.0
Rushville	60	— 2	30.7	2.50	3.4
St. Charles*[b]	50	—15	24.2	1 53	8.0
St. John	69	10	38.9	1.38	T.
Scale- Mound	50	—21	22.2	0.86	10.0
Shobonier	65	4	33.8	1.62	2.0
Strawn	56	— 7	27.9	1.46	2 0
Streator	55	— 5	27.3	1.42	.....
Sullivan	55	— 3	28.3	1.72	4.4
Sycamore	44	—10	22.4	1.37	8.6
Tilden	64	10	36.5	0.99	0.2
Tiskilwa	58	— 5	25.7	1.36	5.0
Tuscola	63	— 5	29.2	2.16	3.7
Walnut	54	— 5	27.0	1.03	4.5
Wheaton*[2]	.....	— 8	23.8	1.42	10.0
Winchester	63	— 2	31.3	2.31	0.8
Winnebago	52	—12	22.4	1.10	9.0
Yorkville	55	—11	24.6	1.17	5.0
Zion	51	— 9	23.1	1.00	10.0
Indiana.					
Anderson	56	— 4	29.0	1.37	4.2
Angola	49	— 1	24.6	3.19	15.9
Auburn	52	— 5	25.4	1.58	.....
Bedford	.....	.....	.....	1.00	.....
Bloomington	.....	— 4	.....	2.15	7.0
Bluffton	54	—10	28.0	1.17	6.0
Boonville	68	14	37.2	0.45	
Bright	60	1	32.3	1.12	4.0
Butlerville	62	1	32.4	1.57	3.5
Cambridge City	58	—15	29.2	1.39	4 0
Columbus	62	— 2	32.6	1.36	3.3
Connersville	60	— 4	29 8	1.70	4.1
Crawfordsville	59	— 3	30.4	1.10	T.
Delphi	56	— 5	26.8	1.41	3.5
Edwardsville*[1]	65	12	35.9	1.11	0.6
Fairmount	58	—12	27.4	1.05	3.7
Farmland	55	— 4	29.6	1.87	6.5
Fort Wayne	54	— 8	27.0	1.49	8 0
Franklin*[1]	61	2	32.1	1.48	6.2
Greencastle	57	1	30.2	1.31	4.6
Hammond	53	— 5	26.8	0.96	1.5
Hector	58	0	29.4	1.47	9.0
Huntington	54	— 4	27.8	2.07	9.4
Jeffersonville	64	15	39.8	1.15	0.5

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Indiana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Knightstown	58	—10	29.2	1.76	7 3
Kokomo	55	— 4	29.0	1.10	2.9
Lafayette	56	— 7	28.0	1.36	2.1
Laporte	54	— 5	26.0	2.75	14.0
Logansport	54	— 4	28.3	1.30	2.6
Madison*[a]	63	9	34.2	1.02	0.5
Madison*[b]	.....	.....	.....	0.92	.....
Marengo	65	9	34.4	1.94	0.5
Marion	55	— 6	28.2	1.27	5.1
Markle	54	—10	27.2	0.67	6.5
Mauzy	59	— 7	29.6	1.67	6.0
Mount Vernon	66	13	36.4	1.59	
Northfield	57	—12	27.0	1.37	5.0
Paoli	66	8	34.4	0.97	1.5
Peru	54	— 6	29 0	1.65	4.6
Prairie Creek	60[4]	3[c]	32.4[d]	0.79	2.0
Princeton	64	12	34.8	1 25	1.0
Rensselaer	55	— 8	27.8	2.10	7.0
Richmond	58	—15	30.0	1.67	5.0
Rockville	60	— 3	29.6	1.10	2.0
Salem	65	8	34.4	1.05	.....
Scottsburg	64	12	34.8	0.93	0.5
Seymour	59	5	31.7	1.40	4.0
Shelbyville	63	2	31.9	2.58	8.0
South Bend	52	— 5	26.2	2.51	18.5
Syracuse	51[4]	— 3[c]	25.4[d]	3.39	20.0
Terre Haute	64	4	34.0	1.16	2.8
Topeka	51	0	28.6	1.10	11.0
Valparaiso	54	— 8	24.8	0.70	7.0
Veedersburg	59	— 4	29.2	1.34	2.0
Vevay	65	11	33.9	0.80	2.0
Vincennes	64	10	32.4	0 86	T.
Washington	63	10	33.7	1.14	.....
Winamac	56	0	27.6	1.47	3.5
Worthington	62	1	31.2	1.41	4.9
Indian Territory.					
Bengal	70	14	44.6	1.90	
Chickasha	69[c]	12[b]	42.7[c]	0.51	
Claremore	68	11	39.8	0.63	
Colbert	81	.....	.....	0.06	
Fairland	69	10	40.0	0.64	
Hartshorne	79	14	46.8	0.90	T.
Healdton	78	11	46.4	T.	
Lehigh	73	16	46.8	1.10	
Marlow	76	12	42.7	0.36	
Muscogee	70	14	42.5	0.35	
Pauls Valley[b]	74	13	45.8	0.16	
Ryan	75	16	46.2	T.	
South McAlester	.....	.....	.....	0.54	
Tahlequah	67	15	42.1	0.85	T.
Tulsa	.....	.....	.....	0.71	
Wagoner	69	11	40.9	0.35	T.
Webbers Falls	71	17	44.0	0.94	
Iowa.					
Afton	51	— 5	26.0	0.76	4.0
Akron	56	— 5	25.2	1.25	12.0
Albia	53	— 4	26.0	0.60	6.0
Algona	46	—10	20.3	0.55	5.5
Alta*[a]	46[f]	— 7	21.1[d]	0.42	3.8
Amana	51	— 9	24.3	1.50	12.9
Ames*[b]	51	— 8	23.6	0.57	5.7
Ames (near)	.....	.....	.....	0.65	6.1
Atlantic	53	—13	24.3	0.78	6.0
Bancroft	48	—11	21.0	0.50	5.0
Batavia	.....	.....	.....	0.60	6.0
Baxter	52	— 5	23.3	0.82	8.2
Bedford	55[b]	— 8[b]	28.1[b]	0.62	7.0
Belknap	55	— 3	28.6	1.23	7.0
Belleplaine	48[b]	— 9	23.8	0.66	6.6
Bonaparte	56	— 3	28.8	1.05	1.5
Britt	46	—10	19.2	0.44	4.3
Buckingham	.....	.....	.....	1.25	10.8
Burlington	56	0	29.6	1.84	2.7
Bussey	.....	.....	.....	0.75	7.5
Carroll	50	— 5	24.0	0.50	5.0
Cedar Rapids	52	—10	25.8	1.05	10.8
Centerville	54	— 3	28.6	0 40	4.0
Chariton	57	— 4	27.0	0.95	9.0
Charles City	43	— 9	19.4	1.10	8 0
Clarinda	56	— 7	27.0	0.82	7.3
Clearlake	45	— 9	19.6	0.50	5.0
Clinton	53	— 7	24.4	1.35	12.2
College Springs	54	— 6	27.1	0.69	5.4
Columbus Junction	56	— 2	27.6	0.92	3.7
Coon Rapids	48	— 8	24.4	0.30	2.0
Corning	52	— 4	26.4	0.50	4.0
Council Bluffs	56	— 2	27.6	0.27	.....
Crawfordsville	.....	.....	.....	0.09	.....
Cresco	40[b]	—12	16.4	0.48	4.7
Cumberland	.....	.....	.....	0.40	4.0
Danville	.....	.....	.....	0.90	.....
Decorah	45	—10	19.4	0.90	9.0
Delaware	47	—16	20.5	0.74	4.6
Denison	51	— 6	22.8	0.35	3.5
Desoto	54	— 4	26.2	0.60	6.0
Dows	49	— 8	20.6	0.89	8.5

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Eldon	58	— 6	27.6	0.98	2.7
Elkader	51[c]	—21	20.2[d]	0.91	9.0
Emerson	.....	.....	.....	0.33	.....
Estherville	46	—17	17.8	0.29	2.9
Fayette	46	—17	20.5	1.10	10.1
Fonda	.....	.....	.....	0.60	6.0
Forest City	45	— 8	19.4	0.90	9.0
Fort Dodge	48	— 8	22.0	0.85	8.5
Fort Madison	.....	.....	.....	1.30	1.0
Fruitland	55	— 8	25.7	0.50	5.0
Galva	49[c]	— 4	23.4[d]	0.22	2.2
Gilman	.....	.....	.....	0.82	8.2
Glenwood	55	— 5	28.8	0.32	3.2
Grand Meadow	.....	.....	.....	0.94	9.5
Greene	46	— 8	20.9	0 96	12.5
Greenfield	53	— 3	25.8	0.41	3.8
Grinnell	49	— 3	24.3	0.75	.....
Grinnell (near)	48	— 7	23.4	1.01	10.5
Grundy Center	47	— 9	22.1	0.75	7.5
Guthrie Center	51	— 6	29.6	1.10	11.0
Hamburg	.....	.....	.....	0.30	3.0
Hampton	.....	— 6	.....	1.01	10.3
Harlan	50	— 9	23.5	0.38	3.1
Hawkeye	.....	.....	.....	1.20	12.0
Hedrick	52[1]	0[1]	26.6[1]	1.05	5.5
Hopeville	53	— 2	26.2	0.60	.....
Hoprig	.....	.....	.....	0.15	1.5
Humboldt	48	— 9	22.3	0.09	0.9
Independence	.....	—14	.....	0.93	8.8
Indianola	.....	— 3	.....	0.89	6.4
Iowa City	55	—10	24.7	1.07	9.0
Iowa Falls	46	— 7	20.8	0.82	8.2
Lacona	.....	.....	.....	1.15	11.5
Lansing	49	—10	22.6	0.66	6.6
Larchwood	50	— 9	21.8	0.30	2.0
Larrabee	48	— 8	21.4	0.22	1.9
Leclaire	.....	.....	.....	0.98	9.0
Lemars	48	— 2	22.8	0.08	0.8
Lenox	51	— 6	25 8	0.23	2.3
Logan	56	—11	23.1	0.70	7.0
Maple Valley	.....	.....	.....	0.25	2.0
Maquoketa	52[1]	— 8[1]	25.6[1]	1.15	.....
Marshalltown	52	—11	24.4	1.05	9.6
Monticello	52	—11	22.7	1.36	10.5
Mooar	.....	3	.....	1.32	.....
Mountayr	54	— 8	26.7	0.76	7.5
Mount Pleasant	55	0	28.0	0.80	.....
Mount Vernon*[b]	52[c]	—10	21.8	1.08	10.5
Murray	.....	.....	.....	0.04	0.4
New Hampton	42	—10	20 0	1.05	10.5
Newton	51	— 8	24.8	1.00	10.5
Northwood	47[c]	— 7	17.5	0.75	7.5
Odebolt	49	— 4	24.4	0 18	2.0
Ogden	48	— 8	22.5	0.55	5.5
Olin	50	—18	20.4	2.34	10.0
Onawa	51	— 3	25.3	0.29	2.8
Osage	43	— 8	18.6	1.22	11.8
Oskaloosa	54	— 7	25.8	0 83	5.0
Ottumwa	57	2	29.4	0.40	3.0
Ovid	56[c]	— 4	26.4[c]	1.86	7.0
Pacific Junction	54	— 6	26 6	0 33	3.1
Pella	55	— 3	25.0	0.75	7.5
Perry	52[f]	0	26.9[c]	.....	.....
Plover	47	—10	21.2	0.50	5.0
Primghar	48[c]	— 5	20.4	.....	.....
Redoak	53	— 5	25.8	0 40	4.0
Ridgeway	49	—11	22.1	1.97	11.0
Rockwell City	47[c]	— 5	24.0[c]	0.80	8.0
Ruthven	44	— 8	15.3	0.35	3.5
Sac City	51	— 6	23.0	0.10	1.0
Scranton	48	— 3	24.1	0.38	3.8
Sheldon	45	— 9	20.0	0.20	1.9
Sibley	47	—11	19.6	0.15	1.5
Sigourney	57	— 6	26.8	1.32	7.5
Sioux Center	46	— 6	21.2	0.27	2.8
Spirit Lake	43	—10	18.1	0.60	6.0
Storm Lake	46	— 7	21.8	0.39	3.6
Stuart	53	0	23.6	0.30	3.0
Thurman	54	— 8	28.0	0.54	5.5
Toledo	54[c]	—10	21.2	1.00	10.0
Villisca	54	— 7	25.7	0.82	7.0
Vinton*[1]	49	— 6	24.4	0.95	9.5
Wapello	54[c]	— 2	28.5	1.11	2.5
Washington	56[c]	— 6	24.4[c]	1.04	.....
Washta	.....	.....	.....	0.45	4.0
Waterloo	49	—10	23.0	1.07	10.0
Waverly	48	— 7	21.8	0.84	8.5
Westbend*[1]	43	—10	19.8	0.50	5.0
Whitten	48[c]	—10	22.0	1.00	10.0
Wilton Junction	54	— 6	25.1	0.78	6.0
Winterset	54	— 1	26.2	0.80	8.0
Woodburn	.....	.....	.....	0.65	6.5
Kansas.					
Abilene	57	— 1	30.5	0.20	2.0
Achilles	66	—21	28.0	0.15	1.5
Altoona	63	4	35.3	1.06	0.5

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Kansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Anthony				0.10	1.0
Atchison *b*	63	— 2	32 2	0.49	0.5
Beloit	61	— 7	26.9	0.55	5.5
Burlington	63	1	33.8	0.57	T.
Campbell	55	— 2[1]	28.6[e]	0.32	2.5
Chanute	67	7	39.4	0.20	
Colby	66	—18	29.0	0.20	2.0
Columbus	64	8	36 8	1.27	T.
Coolidge	66	—14	30.2	0.10	1.0
Delphos	62	— 8	30.1	0.42	2.5
Dresden	65	—18	29.4	0.40	4.0
Ellinwood	66	— 7	32.0	0.46	4.0
Englewood	70	— 4	34.6	0.20	
Eureka				0.49	
Eureka Ranch	68	—18	29.6	0.20	2.0
Fallriver	66	2	36.1	0.85	T.
Fanning	60	—11	31.7	0.45	1.0
Frankfort	60	— 4	30.0	0 30	3.0
Garden City	68	—14	31.5	0.20	1.5
Gove *1	67	—11	32 0	0 20	2.0
Grenola	67	2	35.4	1.07	T.
Harrison	62	— 8	28.5	0.75	3.5
Horton	56	— 3	30.4	0.55	
Hoxie	68	—17	29.2	0.30	3.0
Hutchinson	68	— 6	33.2	0.25	1.0
Independence	63	8	37.2	0 83	T.
Jetmore		—14		0.20	1.5
Lakin	70	—13	32.5	0.10	1.0
Lawrence	60	1	33.4	0.27	1.0
Lebanon	62	—10	27.6	0.70	5.0
Lebo	59	3	33.2	0.42	T.
Little River	64	— 4	32.5	0.30	2.0
Macksville	68	—12	32.2	0.28	0.8
McPherson	62	— 3	32.6	0.43	4.5
Madison	66	3	34 2	0.55	
Manhattan *c*	62[e]	— 2	32.0	0.38	3.3
Marion	60	0	33.8	0.30	1.0
Medicine Lodge	69	0	35 2	0.25	0.8
Minneapolis	60	— 7	30.0	0.33	3.3
Moran	58	7	34.8	1.07	T.
Mounthope *1	64	0	34.1	0.20	
Ness City	68	—11	34.8	0.40	3.0
Newton	63	— 5	32.0	0.02	0.2
Norwich	69	— 2	35.7	0.16	0.5
Oberlin				0.20	2.0
Olathe	61	8	34.6	0.23	1.5
Osage City	65	— 4	32.4	0 35	1.1
Osborne				0.50	3.0
Oswego	67	6	38.6	1.70	
Ottawa		— 2		0.53	1.0
Phillipsburg	64[e]	—12	25.4	0.30	3.0
Pratt	71	— 7	35.3	0.10	1.0
Rome	67	3	36.1	0.50	2.0
Salina	61	— 4	31.2	0.30	2.5
Scott	66	—18	28.1	0.20	2.0
Sedan	64	3	36.2	0.70	
Seneca	60	— 3	30 2	0.26	2.0
Toronto	66	2	33.3	0.95	
Tribune		—18		0.20	2.0
Ulysses	80			0.03	0.3
Valley Falls	59	— 5	32.6	0.11	1.0
Wakeeney (near) *1	62	—15	28.3	0.36	3.5
Wallace				0.56	4.5
Wamego *1	59	— 5	31.2	0.54	5.0
Winfield	69	4	35.3	0 50	
Yates Center	61	— 1	33.8	0.84	T.
Kentucky.					
Alpha *2		14	39.1	3 02	T.
Anchorage	64	10	35.4	1 01	0.7
Bardstown	67	11	36 9	1.32	0.5
Blandville	69	15	37.9	1.93	0.8
Bowling Green	67	15	37.5	2.13	
Burnside				2.70	
Catlettsburg	68	11	34 6	1.52	2 0
Centertown	69	12	37 9	1 61	T.
Earlington	69	13	39 1	1.73	0.4
Edmonton	66	12	37 7	2 31	T.
Eubank	65	12	34.8	2.00	T.
Falmouth				1.01	3.8
Fords Ferry	69	12	37.7	1.67	
Franklin	75	20	39.8	4.06	
Georgetown	64	10	35.2		
Greensburg	68	12	35 6	1.99	
Henderson	68	17	37.0	1.64	
Hopkinsville	69	14	40.4	2.41	T.
Irvington	66	9	34.9	1.30	T.
Jackson	64	15	36.8	1.82	0.5
Jackstown				1.37	0.5
Leitchfield	66	11	35.4	1.99	T.
Loretto *d*	66	8	37.8	1 30	T.
Marrowbone	65	13	36.2	2.08	T.
Maysville	65	5	33 2	1 24	2.3
Mount Sterling	63	11	33 8	1.52	2.0
Owensboro	69	14	39.0	1.61	T.
Owenton	59	9	31.8	1.46	0.7
Paducah *a*				1.56	0.4

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Kentucky—Cont'd.	°	°	°	*Ins.*	*Ins.*
Paducah *b*	71	15	41.2	1.77	1.0
Pikeville	69	19	40 4	2.34	2.0
St. John	65	10	35.9	1.57	T.
Scott	64	4	32.0	1.02	3.7
Shelby City	65	10	35.4	1.89	T.
Shelbyville	64	12	34.7	1.32	T.
Vanceburg	60	10	33.5	2.70	3.0
Warfield	69	12	36.3	2.80	3.0
Williamsburg	64	16	39.3	3.24	T.
Louisiana.					
Abbeville	77	32	56.0	2.65	
Alexandria	76	26	52.6	4.74	
Amite	76	27	52.4	6.40	
Baton Rouge	77	30	52.5	4.59	
Burnside	77	30	55.3	4.89	
Calhoun	70	24	49.0	3.12	
Cheneyville	75	27	52.8	3.38	
Clinton	76	26	50.8	3.63	
Como	78[f]	22[f]	49.4[f]	6.51	
Covington	74	29	52.1	4.73	
Donaldsonville	80	32	55.5	2.50	
Emilie	74	30	53.4	3.86	
Farmerville	71	26	50 5	3.58	
Franklin	75	32	53.5	2.91	
Grand Coteau	74	30	54.1	2.61	
Hammond	76	27	53.4	5.11	
Houma	76	31	54.9	2.64	
Jeanerette	77	31	55.8	3.35	
Jennings	75	30	52.8	3.58	
Lafayette	75	28	53.6	5.48	
Lake Charles	74	31	54.4	3.74	
Lake Providence	83	25	54.1	6.36	
L'Argent	76[f]	26[f]	53.8[f]	4.63	
Libertyhill	76	21	52.0	4.58	
Mansfield	74	21	50.2	2.52	
Melville	79	26	53 0	3.40	
Minden	74	23	50.6	0.72	
Monroe	73	27	51.1	3.28	
New Iberia	74	32	55.0	5.20	
Opelousas	74	28[e]	53.7[e]	3.34	
Oxford	72[b]	21[e]	50.9[e]	2.90	
Paincourtville	77	32	54.3	4.72	
Plain Dealing	72	20	49.6	3.57	
Prevost				3.24	
Rayne	80[1]	28	59.9		
Robeline	75	22	48.7	3.25	
Ruston	72	24	50.3	4.55	
Schriever	79	30	54.2	3.94	
Southern University	76	31	53.4	1.48	
Sugar Ex. Station	74	34	52.4	2 24	
Sugartown	74	32	54.3	1.87	
Venice	76	33	54 4	0 97	
Wallace	78	31	55.0	1.91	
White Sulphur Springs				4.55	
Maine.					
Bar Harbor	45	—13	20.0	4.83	36.0
Belfast *6	46	—20	17.6	4.51	22.5
Bemis	44	—20	14.4	3.60	41.0
Calais	37	—20	19.0	5.30	32.0
Carmel	42	—25	17.4	6.67	36.2
Cornish *1	41	—14	18 6	3.03	20.2
Fairfield	43	—25	14 9	2 74	20.0
Farmington	40	—16	15.9	3 27	34.5
Flagstaff	39	—23	13.4	2.20	22.0
Gardiner	43	—16	18.0	3.78	26 2
Kineo	32	—22	9.2	2.65	26.5
Lewiston	44	—14	18.1	3.19	28 6
Mayfield	38	—21	15.4	2.60	27.0
Orono	42	—20	15.2	4.33	25.5
Rumford Falls	40	—17	16.4	2.77	28.5
Winslow	44	—24	18.8	2.91	15.0
Maryland.					
Annapolis	61	18	35.4	3.30	6.0
Bachmans Valley	55	8	29 8	3 69	11.5
Boettcherville	62	4	33.3	1 60	2.0
Boonsboro *a*	60	9	32.6	2.01	8.0
Charlotte Hall				3.43	
Chase	56	5	29.8	2.23	6.1
Chestertown	58	10	32.2	2.74	12.1
Chewsville	59	8	32.5	2 16	11.0
Clearspring	60	8	31.2	1.69	6.8
Coleman				3.31	6.2
Collegepark	64	6	32.4	1.75	6.5
Cumberland *a*	57	13	33.7	1.14	2.0
Cumberland *b*				1.80	1.8
Darlington	56	7	31.5	2.75	13.0
Deerpark	53[e]	— 4[e]	27.7[e]	6.22	40.0
Easton	60	11	33.4	3.78	8.0
Fallston	62	8	32.4	2.52	10.5
Frederick	59	13	34.4	2.14	7.5
Frostburg	57	2	30.5	2.36	10.5
Grantsville	53	2	29.4	2.52	11 0
Greatfalls	63	8	31.4	2.43	7.5
Greenspring Furnace	59	8	32.8	1.63	3.5
Hagerstown	60	8	33.0	1.82	6.0
Hancock	61	4	31.6	1.44	1.8

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Maryland—Cont'd.	°	°	°	*Ins.*	*Ins.*
Harney				2.34	8.0
Jewell	65	10	35.5	3.04	4.0
Johns Hopkins Hospital	63	14	31.9	2.60	7.0
Laurel	64	7	32.4	2.94	5.0
McDonogh	63	5	29.4	2.85	11.0
Mount St. Marys Coll	58	10	31.7	3.10	8.8
Newmarket	60	8	31.8	2.71	9.5
Pocomoke	63	14	37.8	2.44	3.0
Prince Fredericktown	63	9	35 6	2.99	5.0
Princess Anne	62	10	35.6	2.70	5.5
Rockhall *b*	60	11	34 6	2.41	4.5
Sharpsburg	57	11	34 0	2.29	11.0
Smithsburg *a*	58	8	32.4	1.96	9.0
Smithsburg *b*	58	8	32.0	2.66	12.5
Solomons	67	17	37.2	3.93	6.0
Sudlersville	63	10	35.4	3.12	11.5
Sunnyside	54	— 3	26 3	5.14	21.0
Takoma Park	68	12	33 1	3.57	7.0
Taneytown	55	8	31.2	2 68	7.9
Van Bibber	53	9	31.2	2.28	
Westernport	53	6	28 2	2.31	5.8
Westminster	60	7	31.7	2 87	14.1
Woodstock	62	9	32.1	2.89	9.5
Massachusetts.					
Amherst	41	— 6	24.9	2.09	8.0
Bedford	48	— 8	24.8	1.57	8.0
Bluehill (summit)	48	— 9	24 3	2 05	9.6
Cambridge	56	— 6	28.6	1.73	
Chestnuthill	48	— 6	25.9	1.72	6.8
Cohasset				2.43	5.5
Concord	49	— 8	23.8	1.46	8.7
East Templeton *1	40	— 8	22.2	1.29	9.0
Fallriver	48	— 5	27.9	2.47	4.2
Fitchburg *a* *1	45	— 8	23.8	1.66	10.0
Fitchburg *b*	47	—11	23.6	1.70	12.8
Framingham	48	— 7	25 8	1.86	
Groton	46	—11	22.6	2.04	12.5
Hyannis *1	47	— 4	29.8	3.14	7.5
Jefferson				1.91	11.8
Lawrence	47	—10	28.4	1.50	10.5
Leeds	47	—13	23.1	2.15	7.5
Leominster				1.94	13.0
Lowell *a*	47	— 9	25.5	1.72	
Lowell *b*	47	—11	24.8		
Middleboro	52	—10	26.2	2.20	5.8
Monson	47	— 8	25.8	1.88	9.5
New Bedford *a*	55	— 2	29.8	2.66	8.5
Pittsfield	43	—10	21.8	1.28	7.5
Plymouth *1	51	— 5	29.2	2.91	6.0
Princeton				1.63	14.0
Provincetown	50	2	30.6	3 24	2.2
Salem				1.68	10.0
Somerset *1	53	— 8	28.4	2.03	7.0
Springfield Armory	45	— 5	25.0	1.74	6.8
Sterling				1.52	8.0
Taunton *c*	49	—12	26.1	2.84	3.5
Westboro	48	— 9	26.3	1.78	8.0
Weston	49	— 6	26.0	1.49	8.4
Worcester	47	— 8	25.0	1.49	11.0
Michigan.					
Adrian	50	— 5	24.2	2 12	13.0
Agricultural College	46	—11	22.2	1.51	12.0
Allegan	51	— 5	25.2	0.88	8.5
Alma	46	— 9	21.6	1.88	17.0
Ann Arbor	48	— 7	24.0	1.45	10.1
Annpere	48	1	24.6	1.50	15.0
Arabela	44	—10	22.0	1.28	10.0
Baldwin	45	—12	19.8	1.05	9.5
Ball Mountain	46	— 6	23.2	1.46	10.4
Battlecreek	49	— 2	24.9	2.45	14.1
Bay City	44	1	23.3	1.15	7.5
Berlin	45	—11	20.9	2.03	15.2
Berrien Springs	54	1	26.8	5.40	40.0
Big Rapids	44	—12	19.0	2.07	16.0
Birmingham	47	— 5	23.6	0.90	7.0
Boon	40	—13	17.0	2.66	25.3
Calumet	37	— 3	16 8	2.45	31.5
Carsonville *b*	40	—10	23.3	1.77	9.0
Cassopolis	50	0	26.0	3.85	19.0
Charlevoix	42	—18	23.6	3.25	31.9
Chatham	35	— 8	19.2	2.40	24.0
Cheboygan	42	—18	19.8	1.75	16.5
Clinton	51	— 9	25.2	1.72	10 8
Coldwater	51	— 3	25.0	2.79	13.5
Deerpark				0.58	8.2
Detour	37	—19	19.0	1.85	18 5
Dundee	50	— 3	25.4	1.68	9.3
Eagle Harbor	36	— 1	19.4	1.60	16.0
East Tawas	44	— 5	24 9	1.35	13.5
Eloise	49	—10	25.5	1.68	11.7
Ewen				1.70	17.0
Fairview	47	— 6	22 6	1.55	10.8
Fitchburg	49	—11	23.6	2.35	19.0
Flint	47	—11	21.8	1.25	11.2
Frankfort				1.50	15.0
Gaylord	40	—26	16.7	1.75	17.5

TABLE II.—*Climatological record of voluntary and other cooperating observers.*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean	Precipitation. Rain and melted snow.	Total depth of snow.
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
Gladwin	45	−15	20.0	2.10	21.0
Grand Rapids	48	− 4	24.8	2.41	23.0
Grape	51	− 4	25.6	1.83	9.2
Grayling	42	−22	18.0	1.15	11.5
Hanover	50	− 9	24.2	2.15	11.9
Harbor Beach	45	0	22.2	0.99	7.9
Harrisville	45	−17	19.7	2.01	18.6
Hart	45	− 3	22.9	1.88	16.5
Hastings	48	− 8	23.6	2.54	19.8
Hayes	48	−10	20.8	1.10	11.0
Highland Station	.....	.....	.....	2.72	16.0
Hillsdale	50	− 3	24.5	2.53	17.0
Humboldt	40	−28	6.2	0.93	5.0
Ionia	47	−12	24.0	1.87	15.0
Iron River	42	−20	11.0	0.80	8.0
Ishpeming	38	−13	13.6	0.89	8.9
Ivan	43	− 8	19.0	2.64	25.5
Jackson	50	− 5	25.2	2.36	13.0
Jeddo	42	− 5	22.5	1.82	15.3
Kalamazoo	47	− 5	24.8	1.32	13.0
Lake City	40	−12	17.5	1.45	14.5
Lansing	46	− 6	23.2	1.69	15.7
Lapeer	47	−13	21.8	1.00	10.0
Lathrop	36	−18	14.4	1.15	11.5
Lincoln	44	−14	20.2	0.90	9.0
Ludington	44[1]	5	23.4[6]	1.46	14.6
Mackinac Island	40	−17	20.2	1.58	14.1
Mackinaw	42	−15	19.4	1.37	12.0
Madison	49	− 6	25.0	1.98	10.2
Manceiona	41	−16	18.8	4.14	40.0
Manistee	43	4	23.0	2.78	26.7
Manistique	39	− 8	20.1	1.07	9.5
Menominee	43	− 9	18.3	0.85	8.5
Middle Island [*10]	37	3	23.0	.....	.....
Midland	45	0	24.2	1.40	13.5
Mount Pleasant	46	− 3	21.0	1.33	11.5
Muskegon	45	− 3	24.7	1.90	14.0
Newberry	35	−10	15.9	1.40	14.0
North Marshall	50	− 4	23.0	0.80	6.0
Northport	42	5	23.8	2.95	29.5
Old Mission	44	1	22.8	2.13	20.0
Olivet	45	− 3	24.2	2.44	14.6
Omer	44	−11	18.7	0.80	7.0
Ontonagon	37	−12	12.6	1.00	10.0
Ovid	45	−11	22.2	1.41	12.0
Owosso	54	−11	22.2	1.65	12.5
Petoskey	42	−14	21.4	2.92	26.2
Plymouth	.....	.....	.....	0.76	7.0
Port Austin	42	− 2	22.0	0.65	6.5
Reed City	49[6]	−18	18.4[6]	2.25	19.5
Roscommon	55	0	23.8	1.20	7.0
Saginaw	46	− 6	23.0	1.65	15.7
St. Ignace	40	−18	22.6	0.55	5.5
St. Johns	46	− 4	24.1	1.07	7.7
St. Joseph	50	2	27.6	1.61	8.0
Sidnaw	45	−20	11.6	.....	....
Somerset	49	− 6	23.2	2.20	12.0
South Haven	49	4	26.7	1.39	12.5
Stanton	46	−10	22.2	.....	.....
Thomaston	40	−21	12.4	1.80	18.0
Thornville	46	− 9	22.8	1.97	19.5
Traverse City	55	0	23.4	3.60	34.0
Vassar	45	− 7	21.9	2.72	21.1
Wasepi	50	− 2	24.9	2.52	14.0
Waverly	47	0	25.6	1.09	6.7
West Branch	39	−13	18.4	1.97	18.7
Wetmore	36	−21	15.8	2.10	20.0
Whitecloud	43	−12	22.0	0.95	9.5
Whitefish Point	38	.....	.....	1.34	13.2
Williamston	47	−11	23.6	2.01	11.5
Ypsilanti	48	− 9	24.6	2.42	8.7
Minnesota.					
Ada	48	−23	6.2	0.96	3.0
Albert Lea	45	−10	16.6	0.50	5.0
Alexandria	43	−24	11.5	0.19	2.5
Ashby	40	−19	11.4	0.72	9.2
Beardsley	47	−20	14.2	0.12	1.2
Bemidji	39	−28	7.3	0.49	.....
Bird Island	40	−16	15.2	0.21	2.1
Blooming Prairie	40	−13	15.4	0.35	3.5
Brainerd	41	−26	7.6	0.15	.....
Caledonia	41	−12	17.3	0.71	8.3
Collegeville	44	−15	14.8	0.27	3.8
Crookston	37	−23	6.0	0.35	3.5
Currie	43	−15	13.8	.....	.....
Deephaven	.....	.....	.....	0.53	5.0
Detroit City	40	−30	3.4	0.42	5.5
Faribault	41	−14	17.1	0.98	5.0
Farmington	41	−14	15.8	0.60	6.8
Fergus Falls	41	−21	9.6	0.43	4.3
Glencoe	40	−16	15.0	0.13	1.3
Grand Meadow	40	−14	14.0	0.79	10.0
Hallock	36	−31	1.8	0.17	1.8
Hovland	.....	.....	.....	0.46	6.5
Lake Jennie	43	−20	14.2	0.43	5.0
Lakeside	40	−18	12.8	0.45	4.5

Stations	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Minnesota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Lake Winnibigoshish	38	−33	6.5	0.23	1.3
Leroy	41	−14	17.2	0.68	.....
Luverne	45	−10	18.8	0.11	1.1
Lynd	44	−21	17.1	0.34	4.0
Mapleplain	42	−19	13.5	0.54	6.0
Milan	45	−20	13.1	0.47	4.8
Minneapolis *a*	41	−15	12.5	0.40	4.0
Minneapolis *b* [1]	41[6]	−15	15.0	0.32	5.0
Montevideo	43	−17	14.6	0.35	5.5
Morris	41	−20	12.8	0.40	3.7
Mount Iron	34	−33	6.4	0.15	1.5
Newfolden	35	−31	1.6	0.26	4.0
New London	39	−24	9.0	0.44	4.5
New Richland [*1]	42	− 8	18.6	.....	.....
New Ulm	43	−13	16.4	0.65	6.8
Park Rapids	38	−27	7.4	0.36	3.6
Pine River	40	−32	7.1	0.15	2.0
Pipestone	41	−11	17.4	0.16	1.1
Pleasant Mounds	43	−15	19.0	0.26	4.0
Pokegama Falls	38	−47	1.0	0.26	2.9
Redwing *a*	.....	.....	.....	1.00	9.0
Redwing *b*	41	−16	16.2	0.32	5.0
Reeds	.....	.....	.....	0.51	10.5
Rolling Green	43	−11	16.2	0.30	2.0
St. Charles	47	−15	18.2	0.65	6.5
St. Cloud	45	−18	13.2	0.42	4.0
St. Peter	47	−16	16.8	0.44	4.5
Sandy Lake Dam	40	−36	6.2	0.21	2.8
Shakopee	42	−16	16.0	0.36	3.8
Thief River Falls	.....	.....	.....	0.29	3.5
Tower	38	−34	9.8	0.75	7.5
Two Harbors	37	−20	11.4	0.23	3.0
Wabasha [*1]	44	−11	17.8	0.49	12.2
White Bear	.....	.....	.....	0.29	3.3
Willmar	41	−16	13.0	0.15	2.0
Winnebago City	47	−14	15.4	0.42	4.2
Worthington	43	−12	18.5	0.38	5.2
Zumbrota [1]	43[6]	−15	17.9	.....	.....
Mississippi.					
Agricultural College	69	23	46.8	6.60	
Austin	75	23	47.4	2.78	T.
Batesville	68	20	42.8	6.82	
Bay St. Louis	72	32	52.4	3.26	
Biloxi	76	32	56.2	2.49	
Booneville	65	20	41.0	4.26	T.
Brookhaven	75	23	48.4	2.70	
Canton	74	26	49.8	9.44	
Columbus *b*	68	25	45.9	4.05	
Crystalsprings	73	27	49.1	3.52	
Edwards	71	28	51.2	8.40	
Fayette	73	27	51.4	4.60	
Fayette (near) [*1]	72	31	52.2	3.05	
Greenville *a*	66	29	48.9	4.61	
Greenville *b*	71	28	48.2	4.50	T.
Hernando	68	23	44.8	2.88	
Holly Springs	67	22	43.2	3.91	0.4
Jackson	.....	.....	.....	4.27	
Kosciusko	72	25	48.7	6.60	
Latonia	74	28	52.6	6.60	
Leakesville	74	22	50.0	4.08	
Louisville		24	48.4	6.64	T.
Macon	69	25	45.3	6.21	
Magnolia	74	28	50.0	4.53	
Natchez	75	28	54.2	5.65	
Okolona	66	22	44.4	4.36	
Palo Alto	70	24	46.3	7.07	
Pearlington	74	29	52.2	3.45	
Pontotoc	69	20	44.8	5.18	T.
Port Gibson	74	25	51.6	7.44	
Ripley	68	18	43.4	3.86	
Saratoga	73	24	49.5	3.61	
Shoccoe	.....	.....	.....	7.87	
Stonington [*1]	74	28	51.2	.....	
Thornton	72	28	50.2	9.05	
Tupelo	.....	.....	.....	5.98	
Walnutgrove	71	23	47.4	5.63	
Watervalley	.....	.....	.....	4.54	T.
Waynesboro	73	24	50.4	3.14	
Woodville	74	28	52.5	4.04	
Yazoo City	73	27	49.6	6.75	
Missouri.					
Appleton City	62	6	36.7	1.96	T.
Arthur	62	4	35.8	1.81	T.
Avalon	61	− 2	32.2	0.56	T.
Bethany	57	−11	29.2	0.35	3.6
Birchtree	68	10	39.1	1.46	
Boonville	.....	.....	.....	2.82	1.7
Brunswick	60	− 1	31.8	1.49	0.5
Carrollton	60	3	33.3	1.20	T.
Conception	57	4	30.7	0.31	3.1
Cook Station	72	3	36.7	1.15	
Cowgill [*5]	58	3	31.6	0.35	T.
Darksville	56	− 2	29.7	1.42	3.2
Downing	.....	.....	.....	0.61	0.1
Edgehill [*5]	64	10	33.6	1.01	0.4
Edwards	68	4	36.6	1.90	1.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Missouri—Cont'd.	°	°	°	*Ins.*	*Ins.*
Eightmile [*1]	.....	2	32.7	1.45	T.
Eldon	72	3	36.1	1.40	T.
Elmira	62	− 7	31.6	.....	.....
Fairport	.....	.....	.....	0.49	1.7
Fayette	67	− 3	33.0	2.29	0.8
Fulton	70	4	35.6	3.57	1.0
Galena	.....	.....	.....	0.90	T.
Gallatin [*1]	60	− 2	31.1	0.22	1.0
Gayoso	68	17	41.4	1.16	T.
Glasgow	64	− 2	33.1	1.89	1.0
Gorin	.....	.....	.....	1.21	T.
Halfway	72	4	39.4	0.97	1.0
Harrisonville	60	− 2	31.8	1.54	T.
Hazlehurst	.....	.....	.....	0.60	
Hermann	.....	.....	.....	1.38	
Houston	69	8	38.8	1.35	T.
Houstonia (near)	.....	.....	.....	2.02	1.0
Irena	.....	.....	.....	0.71	5.0
Ironton	70	6	36.2	1.66	0.2
Jackson	.....	.....	.....	1.41	T.
Kidder	60	− 4	30.4	0.82	0.2
Koshkonong	69	12	41.0	0.96	
Lamar	68	16	38.7	1.21	T.
Lamonte	.....	.....	.....	2.34	2.2
Lebanon	70	7	37.3	1.17	0.5
Lexington	63	− 1	34.1	1.32	
Liberty	62	− 8	31.4	0.50	T.
Louisiana	69	− 2	34.8	2.23	0.5
McCune [*1]	66	− 7	33.6	2.45	1.0
Macon	63	− 2	32.6	1.54	T.
Marblehill	67	11	37.9	1.48	0.2
Marshall	62	− 2	33.2	1.94	2.0
Maryville	58	− 5	26.6[6]	0.65	6.5
Mexico	67	− 1	34.0	2.36	1.5
Miami [*5]	58	− 1	31.8	1.15	1.0
Mineralspring	68	17	40.8	0.80	T.
Montreal	69	2	37.0	0.74	T.
Mount Vernon	64	10	34.8	0.87	T.
Neosho	70	9	39.4	0.45	
Nevada	.....	.....	.....	1.40	T.
New Haven	72	7	36.0	0.60	1.0
New Palestine	69	3	34.6	1.64	T.
Oakfield	71	4	37.1	1.07	0.2
Olden	70	7	39.2	1.43	T.
Oregon *a*	58	− 1	30.8	0.69	4.0
Palmyra [*5]	61	0	31.9	1.78	1.1
Phillipsburg [*1]	68	5	36.2	0.93	2.0
Pine Hill	.....	.....	.....	1.16	0.4
Poplarbluff	70	13	41.4	1.37	1.0
Potosi	72	− 5	33.2	1.16	T.
Richmond	60	0	33.6	1.08	T.
Rockport	.....	.....	.....	0.53	4.0
Rolla	.....	.....	.....	0.87	1.0
St. Charles	69	6	36.0	1.67	0.2
St. Joseph	.....	.....	.....	0.38	1.0
Sarcoxie [*5]	.....	5[6]	32.4[6]	0.55	
Seymour	70	7	38.3	1.22	2.5
Shelbina	.....	.....	.....	2.10	2.0
Sikeston	67	17	39.6	2.02	1.0
Steffenville	58	− 2	31.8	1.78	1.5
Sublett	58	− 5	29.3	0.70	1.0
Trenton	.....	0	.....	0.53	T.
Unionville	56	2	29.8	1.10	2.2
Vichy	70	5	37.2	0.85	1.0
Warrensburg	62	2	34.6	2.09	
Warrenton	69	4	32.8	1.59	T.
Wheatland	.....	.....	.....	2.24	1.0
Willowsprings	.....	.....	.....	1.73	0.2
Windsor	64	0	35.3	2.16	0.8
Wylie	72	8	41.0	0.58	
Zeitonia	71	9	37.6	1.73	0.8
Montana.					
Adel	48	−27	21.7	1.35	13.5
Augusta	52	−25	22.3	0.42	10.9
Billings	54	−16	21.0	.....	.....
Boulder	49	−16	19.8	0.58	2.5
Butte	43	− 7	25.4	0.60	6.0
Canyon Ferry	60	−13	21.7	0.44	4.6
Chester	43	−33	13.0	0.60	6.0
Chinook	49	−28	17.1	0.53	5.3
Clemons	50	−23	23.6	1.45	14.5
Columbia Falls	45	− 8	22.0	2.35	12.5
Corvallis	53	5	29.0	0.90	9.0
Crow Agency	56	−24	22.4	0.17	2.0
Culbertson	45	−27	8.8	0.39	.....
Deli	43	−18	30.8	0.05	.....
Dillon	50	− 8	25.6	0.12	0.9
Ekalaka	57	−16	20.0	0.45	.....
Fort Benton	56	−30	23.0	0.80	8.0
Fort Logan	44	−28	18.4	0.72	.....
Glasgow	49	−30	13.0	0.90	.....
Glendive	51	−23	16.7	0.80	8.0
Glenwood	50	−12	22.2	0.82	8.2
Greatfalls	51	−22	24.4	0.74	7.4
Kipp	50	−26	19.5	0.60	6.0
Lewistown	54[6]	−18	21.3	T.	0.5

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Montana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Martinsdale	54	−10	24.3	0.45	3.0
Marysville	45	−17	21.4	2.04	17.4
Missoula	48	− 6	22.0	1.45	10.5
Ovando	48	−16	16.1	1.90	18.7
Parrot	.....	− 7	.....	0.31	3.1
Plains	49	− 1	24.8	1.10	8.0
Poplar	44	−29	10.0	1.05	10.5
Ridgelawn	45	−27	18.1	0.70	7.0
St. Pauls	53	−22	21.0	0.99	9.9
Troy	48	− 3	24.0	2.84	15.5
Twin Bridges [1]	50	−11	20.5	.....	.....
Utica	52	−30	22.6	0.40	3.8
Yale	.....	−12	.....	0.09	0.9
Nebraska.					
Agate	....	.....	.....	0.00	
Agee	.....	.....	.....	0.11	1.2
Albion	64	− 7	25.8	0.20	2.0
Alliance	.....	.....	.....	T.	T.
Alma	69	−17	26.8	0.38	3.8
Ansley	60	−12	25.0	0.30	3.0
Arapaho [1]	59	−16	28.2	0.25	2.5
Arborville [1]	52	− 4	24.9	0.15	1.5
Arcadia	.....	.....	.....	0.10	1.0
Arlington	.....	.....	.....	0.18	.....
Ashland *a*	57	− 5	27.9	0.13	3.0
Ashland *b*	.....	.....	.....	0.31	2.1
Ashton	.....	.....	.....	0.10	2.0
Auburn	58	− 5	29.3	0.61	3.2
Aurora [1]	57	− 6	26.5	0.10	1.5
Bartley	.....	.....	....	0.10	.....
Beatrice	56	− 6	28.4	1.30	4.0
Beaver	66	−17	28.2	0.20	2.0
Bellevue	.....	.....	.....	0.26	2.8
Benedict	.....	.....	.....	0.55	4.5
Benkleman	.....	.....	.....	0.10	1.0
Blair	53	− 3	24.8	0.12	1.9
Bluehill	.....	.....	.....	0.20	2.0
Bradshaw	.....	.....	.....	0.26	2.6
Brokenbow [1]	62	− 2	25.5	0.10	2.0
Burchard	.....	.....	.....	0.15	.....
Burwell	.....	.....	.....	0.10	1.0
Callaway	64	−16	26.6	0.17	2.0
Camp Clarke	62	−25	26.2	T.	T.
Central City	.....	.....	.....	0.50	5.0
Chester	.....	.....	.....	1.11	4.5
Cody	.....	.....	.....	T.	T.
Columbus	59	− 4	26.6	0.12	1.8
Crete	55	− 6	27.7	0.09	2.0
Cuibertson	.....	.....	.....	0.20	2.0
Curtis	69	−20	25.0	0.00	
David City	56	1	26.2	0.55	5.0
Dawson	61	− 3	31.0	0.55	3.0
Eden	.....	.....	.....	0.45	3.0
Edgar *a*	.....	.....	.....	0.20	2.0
Ericson	.....	.....	.....	0.10	1.0
Ewing	.....	.....	.....	0.10	1.0
Fairbury	64	− 6	28.2	0.81	4.0
Fairfield	60	− 8	29.7	0.50	5.0
Fairmont	57	− 9	25.2	0.31	6.0
Fort Robinson	60	−12	28.1	0.10	1.0
Franklin	64	−16	24.2	0.40	4.0
Fremont	54	− 8	26.7	0.40	4.0
Geneva	56	− 5	25.9	0.23	3.5
Genoa	59	− 5	27.2	0.05	1.1
Gering	64	−21	27.2	T.	T.
Gordon	.....	.....	.....	0.00	
Gosper	.....	.....	....	0.20	1.5
Gothenburg	64	−17	25.2	0.40	4.0
Grand Island *a* [1]	52	− 3	27.8	0.20	2.0
Grand Island *b*	63	− 7	27.4	0.17	1.7
Greeley	.....	.....	.....	T.	T.
Guide Rock	.....	.....	....	0.60	5.0
Haigler	.....	.....	.....	0.05	0.5
Hartington	54	− 7	22.4	0.30	3.0
Harvard	60	− 7	26.2	0.21	2.0
Hastings [1]	58	− 3	27.5	0.06	2.0
Hayes Center	.....	.....	.....	0.10	1.0
Hebron	58	− 6	27.9	0.61	3.0
Hickman	.....	.....	.....	0.25	2.5
Holdrege [1]	48	5	28.6	0.20	2.0
Hooper [1]	51	− 3	25.9	0.13	2.1
Imperial	65	−22	27.4	T.	T.
Johnstown	.....	.....	.....	0.04	1.0
Kearney	.....	....	.....	0.10	1.0
Kennedy	63	−12	27.8	T.	T.
Kimball	63	−11	29.4	T.	T.
Kirkwood [1]	60	− 6	24.4	0.17	1.7
Laclede	61	− 7	26.3	0.09	2.0
Lena	.....	.....	.....	0.04	1.5
Lexington	63	−11	25.7	0.20	2.0
Lodgepole	67	−19	27.4	T.	T.
Loup	....	.....	.....	0.25	2.0
Lynch	62	−14	25.2	0.13	1.8
Lyons	.....	.....	.....	0.58	5.8
McCook [1]	59	−16	26.9	0.20	2.0
Madison	58	− 1	26.4	0.20	2.0
Madrid [5]	70	−27	24.8	0.20	2.0
Marquette	.....	.....	.....	0.25	2.5
Mason City	....	....	.....	0.20	2.0
Minden *a*	61	− 9	26.0	0.34	2.4
Monroe	.....	.....	.....	0.17	1.5
Nebraska City *b*	.....	.....	.....	0.40	4.0
Nebraska City *c*	57	− 1	28.2	0.55	.....
Nemaha [1]	61	− 2	31.5	0.20	2.0
Nesbit	63	−15	25.4	0.03	0.5
Norfolk	59	− 7	24.6	0.05	1.8
North Loup	60	− 9	26.6	0.05	0.5
Oakdale	58	− 6	25.3	0.09	1.4
Odell	52	− 8	25.6	0.57	3.0
Ord	.....	.....	.....	0.09	.....
Osceola	.....	.....	.....	T.	
Ough	.....	.....	.....	0.05	0.5
Palmer [5]	72	− 8	28.4	0.10	1.0
Palmyra [1]	58	− 6	26.9	0.36	2.0
Pleasanthill	.....	.....	.....	0.32	3.2
Ravenna *a*	63	−10	26.3	0.25	2.5
Ravenna *b*	.....	.....	.....	0.28	2.8
Redcloud *b* [1]	57	−11	25.0	0.49	4.0
Republican [1]	58	−20	24.1	0.30	3.0
St. Libory	.....	.....	.....	0.10	1.0
St. Paul	63	−13	25.4	0.13	1.5
Salem [1]	56	2	30.7	0.40	3.7
Santee	59	− 4	27.0	0.08	2.0
Schuyler	.....	.....	.....	0.40	4.0
Seneca [1]	64	− 8	24.8	0.05	0.5
Smithfield	.....	.....	.....	0.00	
Spragg	.....	.....	.....	T.	T.
Springview	65	− 5	26.8	0.10	1.0
Stanton [1]	53	− 6	22.0	0.30	3.0
State Farm	57	− 6	28.4	0.24	2.0
Strang	.....	.....	.....	0.25	2.5
Stratton	.....	.....	.....	0.20	2.0
Superior [5]	66	3	30.8	1.00	5.0
Syracuse	.....	.....	.....	0.50	5.0
Tablerock	.....	.....	.....	0.52	3.0
Tecumseh *b*	64	1	28.4	0.70	4.0
Tecumseh *c*	.....	.....	.....	0.75	3.0
Tekamah	53	− 5	25.7	0.45	6.5
Turlington	57	− 4	27.6	0.37	3.5
Wakefield	56	− 9	24.6	0.23	2.3
Wallace	.....	.....	.....	0.04	1.1
Wauneta	.....	.....	.....	0.10	1.0
Weeping Water [1]	52	− 1	24.2	0.49	4.2
Westpoint	55	− 3	26.8	0.30	3.5
Whitman	.....	.....	.....	0.00	
Wilber [1]	54	− 6	27.3	0.15	2.5
Willard	.....	.....	.....	0.04	2.5
Wilsonville [1]	58	−20	25.2	0.36	3.0
Winnebago	.....	.....	.....	0.20	2.0
Wisner	.....	.....	.....	0.23	3.0
Wymore	.....	.....	.....	0.42	2.5
York	.....	.....	.....	0.24	2.0
Nevada.					
Austin	50	− 2	28.8	1.24	.....
Battle Mountain [1]	70	0	37.1	0.70	2.0
Belmont	43	− 3	24.0	0.96	9.0
Beowawe [1]	53	4	34.4	0.52	3.2
Candelaria	63	1	33.2	0.12	0.5
Carlin [1]	50	0	26.6	1.30	13.0
Carson City	60	2	35.1	2.03	7.5
Cranes Ranch	.....	.....	.....	1.21	.....
Elko [1]	44	− 6	23.9	1.32	13.2
Elko (near)	51	−13	26.4	1.05	10.5
Ely	50	−11	24.9	1.10	7.5
Fenelon [1]	49	−10	24.4	0.35	3.5
Golconda [1]	58	0	37.3	1.00	6.0
Halleck [1]	45	− 9	24.7	1.50	15.0
Hamilton	48	−19	25.4	1.11	11.1
Hawthorne	60	17	35.6	0.58	1.0
Hot Springs [1]	58	2	31.9	T.	
Humboldt [1]	49	6	33.8	1.02	3.5
Lee	.....	.....	.....	2.11	19.5
Lewers Ranch	54	− 4	33.5	6.33	13.0
Lovelocks	.....	.....	.....	0.90	11.9
Martins	60	3	35.0	1.95	6.0
Mill City [1]	52	4	35.2	0.40	2.5
Monitor Mill	51	−13	24.2	0.33	4.0
Owyhee	50	1	27.4	1.00	10.1
Palisade [1]	48	1	28.6	0.65	6.5
Palmetto	57	−10	30.0	1.35	6.0
Potts	54	−20	17.4	0.56	7.0
Reno State University	51	5	30.8	2.48	13.5
Tecoma [1]	52	0	30.0	0.20	2.0
Toano [5]	48	−10	26.7	.....	.....
Tybo	48	− 3	27.2	1.80	7.0
Verdi [1]	48	− 3	29.4	3.10	16.0
Wadsworth [1]	66	2	35.2	0.51	2.0
Wells [1]	43	− 4	23.2	1.20	12.0
Wood	49	−11	24.6	1.51	.....
New Hampshire.					
Alstead	....	.....	.....	1.88	16.1
Berlin Mills	42	−30	13.6	1.98	21.7
Bethlehem	43	−22	15.6	1.90	19.5
Brookline [1]	44	−20	22.6	1.56	12.8
Claremont	44	−20	20.0	1.48	11.0
Concord	45	−20	19.8	1.39	15.6
Durham	46	−11	21.7	1.82	13.2
Grafton	47	−23	17.4	1.80	19.0
Hanover	43	−24	17.2	1.78	19.1
Keene	48	−19	20.9	1.69	14.5
Littleton	42	−21	14.4	1.98	20.0
Nashua	47	−12	22.5	2.02	12.5
Newton	47	−11	22.1	1.33	8.0
North Conway	44 [1]	−21 [1]	18.2 [1]	1.90	18.0
Peterboro	44	−19	19.7	2.10	13.1
Plymouth	41	−13	18.0	1.52	17.8
Sanbornton	43	−22	18.4	1.52	14.0
Stratford	40	−29	14.8	2.34	24.5
New Jersey.					
Asbury Park	58	2	32.8	2.56	7.9
Bayonne	56	3	31.4	2.24	2.6
Belvidere	52	0	29.4	2.08	5.0
Bergen Point	58	3	30.9	2.07	3.5
Beverly	63	2	31.6	2.96	8.9
Billingsport [1]	58	8	31.5	2.95	8.5
Bridgeton	62	5	33.6	3.43	5.5
Camden	60	6	31.6	3.27	6.4
Cape May C. H.	58	4	34.0	3.34	7.0
Charlotteburg	52	− 1	27.6	1.96	3.0
Chester	59	− 3	27.8	2.40	7.0
Clayton	61	3	31.5	2.73	8.0
College Farm	60	1	30.8	2.11	4.3
Deckertown	50	− 2	28.8	1.58	3.3
Dover	50	− 1	27.7	1.82	6.5
Egg Harbor City	58	0	31.2	3.11	1.0
Elizabeth	59	2	31.3	2.58	6.0
Flemington	55	3	31.4	2.36	5.7
Freehold	59	1	29.6	2.47	.....
Friesburg	63	6	32.6	3.13	9.5
Hammonton	.....	.....	.....	2.88	10.0
Hightstown	60	3	31.2	2.00	5.0
Imlaystown	51	2	31.6	2.55	7.7
Lambertville	57	4	31.4	3.53	2.6
Layton	47	− 6	26.5	1.35	4.5
Moorestown	61	4	32.0	2.83	10.0
Mount Pleasant	.....	.....	.....	3.27	4.8
Newark	57	0	29.2	1.67	2.6
New Brunswick	59	2	32.2	2.52	3.3
Newton	49	− 4	27.8	1.81	4.0
Ocean City	57	0	33.2	4.00	3.0
Oceanic	57	2	30.6	2.85	4.3
Paterson	55	4	32.0	2.21	3.8
Perth Amboy	59	3	31.7	2.40	5.4
Plainfield	58	1	30.2	1.95	6.7
Rancocas	.....	.....	.....	2.73	8.5
Rivervale	54	− 3	29.9	3.10	6.0
Roseland	59	− 4	28.4	1.86	4.8
Salem	56	8	33.6	2.80	6.7
Somerville	57	4	31.4	2.38	3.0
South Orange	58	0	29.8	1.95	5.0
Toms River	58	− 5	30.6	3.00	10.5
Trenton	58	5	34.6	1.97	3.0
Tuckerton	55	− 3	32.4	3.44	7.0
Vineland	61	4	33.2	2.82	6.5
Woodbine	59	4	34.0	3.32	4.5
New Mexico.					
Albert	74	4	41.0	0.23	2.0
Albuquerque	55	4	35.4	0.65	
Aztec	64	− 6	28.2	1.16	1.8
Bellranch	.....	.....	.....	0.48	T.
Bernalillo	62	3	36.1	0.93	
Bluewater	54	−20	26.4	T.	
Cambray	.....	.....	.....	0.31	
Deming	.....	.....	.....	0.40	0.5
East Lasvegas	58	− 2	34.8	0.27	3.0
Engle	65	8	39.7	0.04	
Espanola	55	−15	29.2	0.43	
Folsom	60	−10	31.0	0.23	2.5
Fort Bayard	64	14	40.7	0.41	T.
Fort Stanton	72	0	39.6	0.10	1.0
Fort Union	70	− 5	36.4	0.10	1.0
Fort Wingate	68	− 5	34.4	0.35	T.
Gage	.....	.....	.....	0.28	
Galisteo	52	3	29.0	0.20	2.0
Gallinas Spring	78	− 5	38.1	0.20	
Hillsboro	57	14	36.2	0.36	0.6
Horse Springs	60	0	32.4	0.17	1.0
Las Vegas Hotsprings	65	− 5	36.2	0.56	1.8
Lordsburg	.....	.....	.....	0.40	
Los Lunas	60	8	36.7	0.80	
Lyons Ranch	70	11	42.8	1.38	
Mesilla Park	73	12	43.4	0.31	
Raton	60	− 2	33.2	0.60	6.0
Roswell	75	10	42.9	0.21	
San Marcial	77	7	43.2	0.01	
Socorro	60	6	37.2	T.	
Springer	69	−16	32.0	0.35	3.5
Strauss	.....	.....	.....	0.75	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New Mexico—Cont'd.	°	°	°	*Ins.*	*Ins.*
Whiteoaks	60	4	37.0	1.52	6.0
Winsors Ranch	56	−13	28.7	2.00	20.0
Woodbury	53	− 3	32.5	0.68	T.
New York.					
Adams				2.61	32.0
Addison	53	− 5	26.5	1.23	8.0
Akron				2.32	
Alden	50	− 8	26.9	2.23	14.2
Alfred	48	− 7	23.6	1.22	6.6
Angelica	51	−12	24.6	2.62	16.5
Appleton	47	− 2	25.8	2.03	
Atlanta	47	−11	23.7	2.18	12.9
Auburn	50	− 6	26.0	2.17	18.5
Avon	48	− 7	24.8	1.68	10.3
Axton	40	−37	13.4	2.19	22.0
Baldwinsville	44	− 7	24.6	3.01	17.0
Bedford *a*	50	3	30.0	1.72	
Blue Mountain Lake				1.30	13.0
Bolivar	49	− 9	24.1	2.20	10.7
Bouckville	40	−13	20.0	3.85	25.0
Boyd's Corners				1.69	
Brockport	48	− 4	25.8	2.75	17.5
Caldwell	43	−17	19.4	2.00	20.6
Canaan Four Corners	43	−11	21.6	3.02	15.3
Canajoharie	44	−11	20.6	1.83	8.6
Canton	44	−15	14.8	1.40	14.0
Carmel	48	− 5	26.3	1.65	7.3
Carvers Falls	44	−21	18.6	1.13	11.0
Catskill	49	1	26.0	0.92	8.0
Cedarhill	46	− 7	24.6	1.30	11.1
Charlotte[a 10]	39	0	23.4		
Cooperstown	42	− 7	21.4	2.47	13.7
Cortland	48	−14	26.0	1.22	7.2
Cutchogue	50	3	30.5	2.77	7.5
Dekalb Junction				2.13	17.0
Elba	47	− 4	25.6	3.86	24.4
Elmira	50	− 1	26.0	1.09	7.4
Franklinville	46	− 9	23.4	2.29	10.8
Fulton				3.18	14.7
Gabriels	38	−26	13.4	2.18	21.0
Glens Falls	45	−12	20.8	1.93	18.7
Gloversville	40	−17	17.6	2.62	22.8
Greenwich	42	−12	21.4	2.33	16.0
Griffin Corners	44	− 8	22.0	1.21	5.9
Haskinville				1.60	7.2
Hemlock	44	0	26.3	1.20	9.9
Honeymead Brook	45	− 6	24.1	1.38	3.0
Honnedaga Lake				3.52	24.0
Humphrey	43	− 4	23.0	2.70	21.2
Indian Lake	40	−27	16.4	2.31	20.6
Ithaca	50	− 4	25.2	1.31	8.4
Jamestown	52	− 5	27.6	3.98	28.0
Jay	45	−20	19.0	1.20	11.8
Keene Valley	46	−17	18.1	2.13	17.3
King Ferry				1.73	15.1
King Station				2.75	20.5
Lake Pleasant				2.05	16.0
Liberty	40	−10	21.1	1.14	6.2
Littlefalls	42	−13	19.4	2.33	17.5
Lockport	54	− 2	29.2	1.70	12.0
Lowville	42	−20	17.4	2.84	21.0
Lyndonville				1.35	
Mayle				1.92	9.8
Meredith	38	−16	20.8	1.65	6.4
Middletown	45	− 1	25.6	1.95	8.5
Mohonk Lake	49	− 4	25.8	1.82	7.9
Moira	45	−16	16.4	3.10	20.0
Newark Valley				1.47	7.0
New Lisbon	41	−14	20.4	1.27	7.4
North Germantown				1.25	
North Hammond	40	−16	17.2	1.48	13.2
North Lake	37	−31	13.0	3.13	31.3
Ogdensburg	45	−20	16.3	1.06	13.3
Old Chatham				1.19	15.0
Oneonta				1.80	6.1
Oxford	42	− 8	22.5	2.89	17.5
Palermo	44	− 7	22.1	3.10	20.6
Penn Yan	51	− 4	25.8	1.81	9.5
Perry City	47	− 7	22.9	2.10	13.7
Plattsburg Barracks	44	−16	18.8	1.73	19.0
Port Byron	44	− 5	24.6	3.05	21.5
Port Jervis	47	− 3	26.8	1.59	4.0
Primrose	53	1	29.4	3.05	6.5
Redhook				1.55	2.0
Richmondville	48			1.69	5.5
Ridgeway	45	− 4	25.4	2.50	16.7
Rome	38	−14	17.2	3.25	19.0
Romulus	50	− 2	26.3	1.69	9.9
St. Johnsville	44	−12	21.5	2.94	14.3
Salisbury Mills				1.52	
Saranac Lake	41[f]	−24	15.4[c]	1.72	17.4
Saratoga Springs	40	−17	20.4	2.01	19.7
Schenectady	40	−10	22.0	2.17	13.5
Setauket	53	2	30.8	1.96	4.6
Shortsville	46	− 2	25.2	1.31	10.3
Skaneateles				2.67	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New York—Cont'd.	°	°	°	*Ins.*	*Ins*
South Berlin	46	−16	22.2	4.15	20.0
South Canisteo	49	− 8	24.6	1.95	11.9
Southampton	43	2	31.2	3.20	10.5
Southeast Reservoir				1.78	
South Kortright	44	− 7	22.7	1.84	6.2
South Schroon				1.86	21.5
Straits Corners	45[c]	− 9[c]	22.8[c]	1.68	8.7
Ticonderoga	46	−14	20.5	1.82	20.0
Volusia	46	− 3	25.2	3.41	
Walton	43	− 6	23.4	1.88	8.8
Wappingers Falls	49	− 2	27.2	2.64	13.5
Warwick				1.22	
Watertown	45	−14	21.6	1.85	16.9
Waverly	49	− 5	26.0	1.22	7.6
Wedgwood	48	− 7	22.9	2.05	13.1
Wells	40	−29	17.0	2.52	17.7
West Berne	44	−11	21.0	2.40	16.0
West Chazy	43	−26	16.2		
Westfield *a*	51	2	28.6	2.10	16.7
Westfield *b*	48	0	26.4	2.58	
Westfield *c*	52	3	29.3	1.88	9.8
Windham	45	− 8	23.2	1.34	7.8
Wolcott				2.05	8.7
North Carolina.					
Abshers	68	14	39.2	3.29	4.0
Asheville				2.48	0.9
Biltmore	62	15	34.6	2.12	0.8
Bryson City				4.89	2.0
Chapelhill	73	20	40.0	2.39	
Cherryville	66[d]	17[d]	41.9[d]	2.72	
Currituck				2.10	4.0
Durham	72	20	41.2	2.10	T
Edenton	69	21	42.9	2.75	4.0
Fayetteville	79	21	43.2	2.62	
Flatrock	61	13	37.4	4.15	T.
Goldsboro	76	23	41.4	2.65	
Greensboro	66	20	39.0	2.72	
Hendersonville	64	14	37.7	3.39	T.
Henrietta	67	21	42.5	2.65	T.
Highlands	55	6	33.5	6.20	2.2
Horse Cove	61	11	38.2	5.85	0.1
Kinston	80	20	44.0	2.76	T.
Lenoir	65	16	37.2	3.70	1.0
Linville	53	7	32.2	2.97	6.0
Littleton	73	16	38.0	1.92	3.5
Louisburg	73	17	40.3	2.23	T.
Lumberton	74	24	42.4	4.02	
Marion	68	15	40.9	4.10	0.9
Marshall	61	14	37.4	3.58	0.6
Mocksville	69	18	41.0	2.01	T.
Moncure	78	21	42.0	2.30	
Monroe	72	18	41.0	2.83	
Mountairy	63	15	37.6	3.53	4.0
Murphy				7.50	
Newbern	75	23	45.8	2.88	T.
Oakridge	69	16	38.4	2.56	
Patterson				3.68	2.0
Pittsboro	73[c]	19	41.4[c]	1.76	T.
Rockingham	74	23	41.5	2.18	
Roxboro	68	19	39.7	2.20	T.
Salem	66	18	39.3	2.31	
Salisbury	76	22	42.5	3.20	
Saxon	66	16	39.7	2.75	3.0
Selma	72	20	41.4	2.08	T.
Settle	66	18	40.0	2.32	0.5
Sloan	77[c]	20[c]	44.4[c]	3.09	
Soapstone Mount	70	15	38.8	2.22	T.
Southern Pines *a*	75	19	44.8	3.19	
Southern Pines *b*	73	22	43.2	3.06	
Southport	70	23	47.2	3.72	
Statesville	68	13	40.0	2.28	T.
Tarboro	78	18[c]	41.4[c]	1.85	1.0
Washington	81	21	44.4	2.62	1.0
Waynesville	62	11	37.0	4.83	T.
Weldon *a*	71	21	39.2	2.30	1.5
Weldon *b*				2.22	
North Dakota.					
Amenia	40[d]	−21[d]	6.6[d]	0.15	1.5
Ashley [d]	44	−25	10.4	0.00	
Berlin	48	−23	10.1	0.29	2.9
Bottineau	36	−31	1.8	0.45	4.5
Churchs Ferry	39	−32	1.4	0.43	4.3
Coalharbor	48	−25	11.8	0.17	1.7
Devils Lake	38	−29	2.2	0.10	1.0
Dickinson	50	−20	17.2	0.01	0.1
Dunseith	38	−25	2.0	1.64	16.4
Ellendale	50	−18	14.0	0.10	1.0
Falconer	46	−21	13.9	T.	T.
Fargo	41	−20	6.4	0.05	0.5
Forman	46	−18	10.9	0.10	1.0
Fort Berthold [s]	54	−27	13.8	0.35	3.5
Fort Yates	68	−19	17.9	0.13	1.3
Fullerton	50	−20	11.8	0.30	3.0
Gallatin	36	−30	4.2	0.27	2.7
Glenullin	50	−15	15.0	0.02	0.2
Grafton	37	−24	4.0	0.13	1.3

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
North Dakota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Hamilton	33	−28	1.7	0.17	1.7
Hannaford	42	−28	5.6	0.28	3.1
Jamestown	40	−24	6.0	0.03	0.3
Larimore	41	−25	3.2	0.50	5.0
McKinney	39	−32	3.3	0.60	6.0
Mayville	43	−20	6.7	0.55	5.5
Medora	51	−19	17.8	0.30	3.0
Milton	30	−30	−0.2	0.60	6.0
Minnewaukon	39	−32	3.0	0.29	3.5
Minto	35	−26	2.2		
Napoleon	40	−21	9.7	0.10	1.0
New England	51	−19	17.0		
Oakdale	47	−26	14.9	0.04	0.4
Pembina	35	−39	0.2	0.60	6.0
Portal	38	− 31	5.0	0.50	5.0
Power	45	−22	8.2	0.32	3.2
Sheyenne	37	−29	5.2	0.03	0.3
Steele	40	−25	8.4	T.	T.
University	38	−20	6.4		
Wahpeton	42	−19	10.2	0.67	6.7
Willow City	43	−37	2.0	0.16	1.6
Woodbridge	36	−36	−0.4	0.37	3.7
Ohio.					
Akron	52	3	27.6	1.67	8.2
Annapolis	53	− 2	29.4	1.65	1.5
Ashland	50	− 4	27.4	1.83	8.0
Ashtabula	55	4	29.2	1.85	11.0
Atwater				2.20	4.5
Bangorville	55	− 2	27.4	2.24	8.2
Bellefontaine	53	− 2	26.6	0.86	6.0
Bement	50	− 3	26.8	1.19	0.7
Benton Ridge	53	− 6	27.6	1.42	11.2
Bethany	58	− 2	31.9	1.24	3.5
Bigprairie	54	− 2	29.2	2.04	5.5
Binola				1.49	7.5
Bladensburg	55	3	29.8	2.16	6.0
Bloomingburg	57	− 3	31.4	1.73	8.5
Bowling Green	54	− 8	26.4	2.57	10.2
Bucyrus	56	− 6	26.9	2.45	8.5
Cambridge	55	− 4	31.0	2.17	6.0
Camp Dennison	58	− 1	32.7	1.19	6.1
Canal Dover	59	5	29.9	2.17	5.5
Canton	53	− 4	30.1	2.81	16.0
Cardington	54	− 7	27.4	1.86	7.3
Cedarville				1.70	6.2
Celina				1.74	8.5
Circleville	58	− 2	30.8	0.85	7.0
Clarksville	57	− 4	32.0	1.39	5.1
Cleveland *a*	56	7	29.6	1.58	6.4
Cleveland *b*	58	6	27.7	1.01	3.2
Coalton	60	− 5	33.4	1.36	7.0
Colebrook	52	− 4	26.6	1.68	10.0
Dayton *a*				1.90	5.6
Dayton *b*	58	− 4	30.2	2.00	5.3
Defiance	54	− 6	25.7	1.10	7.9
Delaware	56	− 6	29.0	1.76	6.4
Demos	54	6	30.1	1.65	6.0
Elyria	55	− 1	27.6	1.16	3.6
Findlay	55	− 1	28.2	1.46	4.5
Frankfort	59	− 2	32.0	1.24	8.5
Garrettsville	53	− 7	27.6	2.20	12.9
Granville	57	4	28.4	2.51	10.5
Gratiot	54	2	30.4	1.75	7.6
Green	66	8	33.7	1.15	3.0
Greenhill	53	− 3	27.2	1.68	4.1
Greenville	53	− 3	28.6	1.78	5.5
Hanging Rock	67	11	35.0	1.40	3.0
Hedges	53	1	27.7	1.12	2.6
Hillhouse	54	− 3	26.0	2.17	10.2
Hillsboro	58	− 2	31.0	1.10	4.0
Hiram	57	2	27.0	2.37	14.5
Hudson	53	0	27.5	1.65	
Jacksonboro	56	− 3	30.0	2.40	10.0
Kenton	54	− 5	29.0	2.61	14.6
Killbuck	52	4	29.0	0.84	6.5
Lancaster	59	1	31.9	1.68	8.1
Leipsic	52	− 7	27.3	1.33	8.3
Lordstown	51	− 2	26.6	1.91	6.5
McConnelsville	57	3	32.4	1.41	9.5
Mansfield				3.20	13.0
Marietta	57	9	35.0	1.09	5.2
Marion	55	− 3	29.0	2.34	11.3
Medina	54	− 6	27.4	1.63	6.0
Milfordton	53	1	27.6	2.51	10.0
Milligan	57	2	31.5	1.24	6.0
Millport		− 4		1.65	4.1
Montpelier	51	− 5	25.4	3.30	16.0
Moorfield	56	4	30.6	1.66	6.5
Napoleon	53	− 5	28.0	1.58	11.5
New Alexandria	53	6	30.8	2.90	8.0
New Berlin	50	0	27.8	1.54	3.5
New Bremen	57	− 8	28.1	1.28	6.5
New Holland	58	− 2	31.7	1.26	6.2
New Paris	57	− 7	29.0	1.96	6.2
New Richmond	61	5	33.8	0.81	1.9
New Waterford	51	− 2	28.3	2.12	8.5

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
North Lewisburg	53	— 5	27.2	2.32	8.2
North Royalton	54	— 3	27.1	1.25	6.0
Norwalk	55	— 6	28.0	2.12	8.5
Oberlin	59	— 7	27.6	1.20	3.3
Ohio State University	56	— 1	30.3	1.77	5.7
Orangeville	50	— 8	26.2	1.21	6.5
Ottawa	54	— 9	27.9	1.64	9.5
Pataskala	58	0	29.2	2.01	6.7
Philo	55	2	31 0	0.67	4.8
Plattsburg	55	— 7	29.0	2.30	11.0
Pomeroy	58	7	33.0	1.63	8.2
Portsmouth *a*				1.28	2.0
Portsmouth *b*	63	10	34.0	1.58	3.9
Pulse				1.55	3.4
Richwood	55	— 8	27.7	1.71	8.3
Ripley	61	2	33.4	0.99	5.3
Rittman	58	— 5	29.3	2.28	5.0
Rockyridge	54	— 6	27.3	1.53	3.8
Rosewood	53	— 7	28.1	2.44	5.0
Shenandoah	55	— 4	26.8	1.30	4.3
Sidney	52	— 5	28.0	2.02	7.8
Sinking Spring	55	1	31.5	1.12	4.0
Somerset	56	1	32.0	1.72	5.1
Springfield				1.81	4.5
Strongsville				2.23	5.0
Swanton				2.01	5.0
Thurman	60	4	34.6	0.70	
Tiffin	54	1	28.2	1.86	13.8
Upper Sandusky	54	— 3	30.2	1.50	6.0
Urbana	55	— 6	28.6	2.36	7.5
Vanwert	54	— 6	28.4	1.68	8.8
Vermillion	57	— 5	26.8	1.64	4.5
Vickery	55	— 5	27.3	1.39	7.6
Walnut				1.30	5.2
Warren	52	3	28.0	1.89	10.2
Warsaw	54	3	29.5	1.92	6.0
Wauseon	52	—10	25.9	2.10	12.5
Waverly	59	4	31.1	1.41	6.2
Waynesville	57	— 3	30.3	1.83	7.0
Wellington	56	— 2	28.6	1.63	9.0
Westerville	54	1	30.2	2.05	7.7
Willoughby				1.74	5.0
Wooster	53	— 4	28.3	1.58	3.5
Youngstowa				1.67	4.0
Zanesville				1.51	8.0
Oklahoma.					
Arapaho	71	5	39.0	0.25	T.
Beaver	68	— 6	34.0	0.10	T
Blackburn	67	5	37.0	0.94	
Burnett	75	10	41.9	0.36	
Clifton	74	8	41.0	0.75	
Fort Reno	69	4	38.6	0.45	
Fort Sill	72	6	42.0	0.50	
Hennessey	70	9	38.9	0.95	T.
Jefferson	68	4	35.8	0.40	0.8
Jenkins	69	— 2	37.0	0.25	1.0
Kenton	68	—11	36.0	0.40	4.0
Kingfisher	70	6	39.8	0.90	T.
Mangum	69	13	43.4	0.20	
Newkirk	60	7	37.0	0.55	
Norman	71	12	40.6	0.55	T.
Pawhuska	64	9	36.8	0.70	
Perry	66	6	39.0	0.98	
Prudence	72	— 3	36.8	0.23	
Sac and Fox Agency	71	8	40.0	0 55	
Stillwater	67	9	40.3	0.62	T.
Taloga	70	4	37.4	0.50	T.
Texmo	75	4	41.5	T.	
Vittum	65	9	39.2	0.27	T.
Waukomis	68	3	38.5	0.45	
Woodward	72	1	38.9	0.50	
Oregon.					
Albany *a* [1]	55	28	40.6	6.44	1.0
Albany *b*				7.13	1.8
Alpha	59	23	40 2	17.96	7.0
Ashland	57	12	36.5	2.74	16.7
Aurora [1]	56	28	40.4	6.17	1.0
Aurora (near)	56	25	38.6	7.83	4.3
Bandon	70	37	45.6	13.63	
Bay City	60	24	42.0	14 59	2.5
Beulah	57	— 8	30.0	2.15	17.0
Blalock					6.5
Brownsville [1]	60	28	41.4	10.07	5.0
Bullrun	47	28	36.2	11.77	17.0
Burns	45	— 8	23.4	1.20	12.0
Cascade Locks	57	28	39.9	11.87	51.0
Comstock [1]	58	29	39.4	7.28	2.5
Coquille				12.91	
Corvallis	55	24	39.0	8.47	5.5
Dayville	55	4	33.6	1.33	5.5
Ella				1.73	8.0
Eugene	58	27	38.9	8.36	2.5
Fairview	57	27	42.2	14.76	5.0
Falls City	53	25	36.4	16.29	20.1
Forest Grove	54	21	37.7	9.81	49.0
Gardiner	57	31	44.1	17.28	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Oregon—Cont'd.	°	°	°	*Ins.*	*Ins.*
Glenora	53	24	36.4	17.10	34.5
Government Camp	58	12	32.0	11.05	60.0
Grants Pass	58	20	37.6	7.08	4.3
Hare	65	29	42.8	19.39	5.5
Harris	53	21	36.8	10.34	18.3
Hood River (near)	59	18	35.8	7.66	35.0
Jacksonville	57	17	34.0	10.20	20.2
Joseph	50	— 4	26.0	1.95	14.5
Junction City [1]	56	28	40.4	7.79	3.5
Kerby	56[d]	18	37.5	14.92	11.5
Klamath Falls	44	— 6	25.2		53.0
Lafayette [1]	58	28	40.2	8.23	10.0
Lagrande	49	— 2	33.1	1.78	3.5
Lakeview	51	— 5	27.0	3.01	17.8
Lonerock	67			2.67	17.5
McMinnville	54	27	39.1	10.24	2.0
Merlin [1]	54	24	37.7	4.18	5.5
Monmouth	54	29	39.6	6.13	6.2
Monroe	52[d]	26	43.3[c]	11.43	6.0
Mount Angel	57	27	39.0	7.53	0.4
Nehalem				14.73	4.3
Newberg	56	27	39.0	9.15	
Newbridge	55	1	30.7	0.58	2.5
Newport	61	29	44.2	10.89	
Pendleton	60	12	36.2	1.58	7.4
Placer				7.06	29.0
Prineville	76	— 3	32.7	0.72	3.3
Riddles [1]	60	26	37.4	7.16	7.0
Riverside	52	5[b]	30.6	0.40	1.0
Salem *b*		28		7.43	3.0
Sheridan [1]	55	26	37.8	9.02	9.0
Silverlake	54	— 7	26.6	0.08	0.8
Silverton [1]	62	28	40.0	7.40	1.0
Siskiyou [1]	43	18	31.8	10.20	102.0
Sparta	44	9	26.9	2.00	19.0
Springfield [1]	57	29	38.4	8.98	3.0
Stafford	53	24	37.0	11.96	19.0
The Dalles	52	20	35.4	3.46	9.3
Toledo	58	26	42.0	10.63	0.5
Umatilla				0.92	2.5
Vale	54	7	32.3	0.98	3.0
Westfork [1]	48	26	34.0	10.87	8.2
Weston	61	10	32.4	2.56	15.5
Williams	58	20	37.2	8.07	11.0
Pennsylvania.					
Aleppo	56	10	32.6	1.71	4.0
Altoona	58	1	28.3	1.89	
Athens	49[c]	— 5[c]	27.1[c]	0.74	3.8
Beaver Dam				2.30	T.
Bellefonte	53	6	30.2	2.08	11.0
Brookville				1.68	9.2
Browers Lock				3.11	
Butler	52	— 1	28.4	2.83	9.6
Carlisle	43	10	29.2	1.99	10.0
Cassandra	50	1	27.1	2.54	17.2
Chambersburg	54	8	29 6	1.54	4.1
Coatesville	58	6	31.6	3.12	11.5
Confluence	55	— 3	28.4	2.91	6.6
Davis Island Dam				1.80	4.7
Derry Station	56	3	30 4	3.55	6.0
Doylestown				2.35	
Drifton	46	— 4	26.8	1.90	9.5
Driftwood				1.97	
Duncannon				1.90	8.5
Dushore	45	— 7	24.4	1.10	6.7
Dyberry	43	— 8	23.4	1.98	9.0
East Bloomsburg				1 32	9.8
East Mauch Chunk	47	— 6	28.3	2.06	8.8
Easton	48	2	29.8	2.14	4.7
Ellwood Junction				2.67	5.0
Emporium	50	— 1	26.8	2.55	13.5
Ephrata	52	5	30.7	2.40	7.8
Franklin	58	— 2	28.4	2 31	3.0
Freeport				2.99	7.3
Girardville				2.48	14.5
Grampian	50	— 2	25.0	2.03	7.0
Greensboro	55	4	31.9	1.83	5.2
Hamburg				3.11	13.0
Hawthorn	55	0	29.0	2.68	9.2
Herrs Island Dam				1.87	
Huntingdon *a*	55	4	30.4	1.97	10.1
Huntingdon *b*				1.32	7.7
Irwin	55	10	33.0	1.27	3.5
Johnstown	55	4	31.4	3.52	12.0
Karthaus				0.88	9.0
Keating				1.99	6.7
Kennett Square	58	6	31.8	3.13	11.0
Lancaster	59	10	34.2	2.46	9.2
Lansdale				2.24	
Lawrenceville	51	—10	23.4	1.60	10.0
Lebanon	48	7	30.0	2.46	10.5
Leroy	46	— 4	24.2	0.99	5.7
Lewisburg	48	5	28.8	1.67	6.5
Lockhaven *a*	55	4	30.2	2.46	15.5
Lockhaven *b*				2.32	13.0
Lock No. 4				1.44	5.8

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Pennsylvania—Cont'd.	°	°	°	*Ins.*	*Ins.*
Lycippus	57	8	29.6	2.83	10.5
Mifflin				2.00	11.0
Oil City				2.55	10.1
Ottsville				2.68	
Parker				2.75	6.3
Philadelphia	59	9	33.8	2.67	7.1
Pottstown	49	12	34.3	2.70	9.0
Quakertown	52	1	30.2	2.57	7.5
Reading [2]			29.4	2.40	
Renovo *a*				1.58	7.0
Renovo *b*	54	4	29.2	1.37	10.3
Saegerstown	52	—10	27.8	2.52	10.8
St. Marys	46	— 2	24.6	1.86	13.9
Selsholtsville				2.51	
Selinsgrove	47	6	30.2	2.03	11.0
Shawmont				2.59	6.0
Sinnamahoning				1.49	9.5
Smethport	50	— 3	25.2	2.40	9.0
Smiths Corners				2.36	
Somerset	52	— 2	26.7	4.41	15.4
South Eaton	46	0	27.6	0.92	1.0
Springmount				2.25	
State College	52	4	27.7	1.82	9.2
Sunbury				1.25	8.0
Swarthmore	56	9	29.6	2.31	8.4
Towanda	48	— 3	26.8	0.91	4.5
Troutrun				1.43	7.6
Uniontown	55	7	33.0	3.00	9.0
Warren	47	— 3	26.0	3.06	8.3
Wellsboro	52	1	27.7	1.27	7.5
Westchester	55	7	31.2	3.02	9.2
West Newton				1.79	5.0
Westtown	48	6	29.8	3.08	11.7
Wilkesbarre	48	2	28.6	2.10	7.0
Williamsport	49	8	29.3	1.40	6.5
York	52	8	30.1	2.72	10.7
Rhode Island.					
Bristol	47	1	29.4	1.21	4.0
Kingston	50	— 9	26.4	2.44	6.0
Pawtucket	51	6	31.0	2.10	6.5
Providence *a*	50	— 3	28.6	1.93	5.8
Providence *c*	50	— 6	26.8	2.14	5.0
South Carolina.					
Batesburg	70	30	43.6	3.75	
Beaufort	70	30	50.8	3.28	
Blackville	77	24	46.3	3.80	
Calhoun Falls				5.54	
Camden				3.75	
Cheraw *a*	76	23	43.9	3.10	
Cheraw *b*				2.95	
Clemson College	67	19	41.4	5.32	
Conway				3.30	
Darlington				3.63	
Edisto				3.18	
Effingham				4.31	
Florence	76	26	44.3	3.41	T.
Gaffney				2.91	
Georgetown	67	28	45.7	5.15	
Gillisonville	79	21	48.1	2.61	
Greenville	65	21	40.8	4.95	
Greenwood	69	24	43.5	3.96	
Kingstree *a*	74	26	45.8	3.82	
Kingstree *b*				4.23	
Liberty	65	18	42.3	5.60	
Little Mountain	71	25	45.2	3.27	T.
Longshore	71	21	44.2	4.39	
McCall	77	24	44.1	2.97	T.
Pinopolis [1]	72	28	45.9	1.20	
St. Matthews	75	26	46.8	4.42	
St. Stephens				3.64	
Santuck	72	21	43.4	3.06	T.
Shaws Fork	75	21	45.6	4.39	
Smiths Mills				3.88	
Societyhill	73	25	43.2	2.76	T.
Spartanburg	66	21	40.4	3.06	
Statesburg	75	25	47.0	3.76	
Temperance	78	23	44.2	5.50	T.
Summerville	75	25	47.8	2.93	
Trenton	71	28	48.1	3.86	
Trial	81	21	47.0	2.94	
Walhalla	69	19	41.6	5.12	T.
Winnsboro	66	22	44.6	2.26	
Winthrop College	70	20	42.1	2.64	
Yemassee	76	27	47.5	2.86	
Yorkville	69	24	44.6	2.42	
South Dakota.					
Aberdeen	54	—18	13.4	T.	T.
Academy	63	—13	25.4	0.08	0.7
Alexandria	60	—10	20.6	0.10	1.0
Armour	60	—13	22.4	0.21	2.0
Ashcroft	59	—17	22.0	0.20	2.0
Badnation	62	— 9	26.8	0.07	0.8
Bowdle	53	—18	14.7	T.	
Brookings	49	—15	16.8	0.09	1.2
Canton	49	— 7	21.2	0.15	1.5
Centerville				0.16	1.9

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
South Dakota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Chamberlain	62	−10	25.2	0.08	0.8
Clark	52	−13	18.7	0.10	1.0
Desmet	54	−11	17.9	0.20	2.0
Doland	55	−13	17.4	0.09	1.2
Elkpoint	58	− 5	23.7	0.34	2.2
Farmingdale	.....	.....	.....	T.	T.
Faulkton	57	−16	18.4	0.15	2.5
Flandreau	45	−13	15.7	0.05	0.6
Forestburg	58	−16	19.8	0.05	0.5
Fort Meade	58	−10	27.0	0.47	4.7
Gannvalley	37	−10	20.3	0.30	3.0
Gary	41	−17	17.2	0.15	1.5
Grand River School	57	−11	20.6	T.	T.
Greenwood	61	− 7	27.1	0.24	2.4
Hartman	52	−13	18.6	0.09	1.0
Highmore	55	−12	19.8	0.30	3.0
Hotch City	61	−16	24.7	0.10	1.0
Howard	54	− 5	19.0	0.26	2.5
Interior	60	−12	26.3	T.	T.
Ipswich	55	−20	15.6	0.02	0.5
Kimball	59	−13	23.0	0.16	1.6
Leola	54	−23	13.6	T.	T.
Leslie	62	−10	26.0	T.	
Mellette	57	−15	20.3	0.10	1.0
Menno	58	− 9	21.9	0.11	1.6
Millbank	50	−10	16.6	0.30	3.0
Mitchell	59	− 9	24.2	0.11	1.0
Mound City	55	−15	17.8	T.	T.
Oelrichs	58	− 8	27.8	0.00	
Parker	52	−10	21.6	0.07	1.5
Pine Ridge	.....	−14	.....	T.	T.
Plankinton	52	−15	21.2	0.04	1.0
Redfield	58	−14	20.6	0.08	2.0
Rochford	57	−25	24.7	0.28	2.8
Ro ebud	56	− 9	24.0	0.10	1.0
St. Lawrence	60	−19	20.5	0.02	0.2
Silver City	.....	.....	.....	T.	T.
Sioux Falls	50	− 7	17.0	T.	T.
Sisseton Agency	44[e]	−17[e]	14.6[e]	0.17	2.2
Spearfish	59	− 7	28.9	0.38	4.0
Tyndall	60	− 1	24.5	0.18	2.0
Vermillion	55	0	25.4	0.17	1.5
Watertown	49	−14	16.0	0.13	1.3
Waubay	43	−17	11.6	0.10	4.0
Wentworth	55	−13	18.9	0.12	1.2
Wessington Springs	.....	−17	.....	0.20	2.0
Wolsey	.....	.....	.....	0.20	2.0
Tennessee.					
Andersonville	63	17	36.8	4.68	4.0
Ashwood	67	18	41.2	3.97	
Benton	65	22	40.8	6.31	
Bluff City	.....	.....	.....	3.06	1.0
Bolivar	68	20	42.0	3.75	T.
Bristol	60	15	34.7	2.20	1.0
Byrdstown	65	14	37.8	2.82	T.
Carthage	68	.....	.....	2.74	
Charleston	.....	.....	.....	6.16	
Clarksville	68	20	39.2	2.99	T.
Clinton	.....	.....	.....	3.45	
Decatur	64	20	40.0	4.9[g]	T.
Dickson	69	15	40.1	3.42	T.
Dover	67	15	39.2	2.95	
Elizabethton	65	16	36.2	3.81	4.0
Elk Valley	66[e]	12	38.2[e]	1.88	T.
Erasmus	67	13	36.4	5.29	T.
Florence	66	19	40.1	3.50	T.
Franklin	69	18	39.9	3.47	
Grace[*1]	70	18	38.2	5.00	
Greeneville	63	15	36.8	4.45	0.6
Harriman	65	19	38.8	3.64	0.5
Hohenwald	65	11	38.1	4.80	T.
Iron City	68	11	40.8	5.11	
Jackson	68	23	43.8	2.60	
Johnsonville	70	13	40.4	3.64	
Jonesboro[*1]	60	19	34.9	4.09	0.5
Kingston	.....	.....	.....	3.94	T.
Lafayette[*2]	67	13	37.6	4.00	
Lewisburg	68	18	40.6	4.44	T.
Lynnville	66	19	40.8	4.71	T.
McKenzie	68	17	41.4	3.25	T.
McMinnville	70	18	40.9	5.30	T.
Newport	62	18	38.6	4.43	T.
Nunnelly	69	15	40.0	3.55	T.
Oakhill	67	15	39.8	3.83	T.
Palmetto	67	18	40.4	4.07	
Peryear[*2]	65	18	42.5	1.97	T.
Pope	68	13[j]	40.2[e]	4.71	T.
Rogersville	61	18	36.2	3.86	4.8
Rugby	67	12	36.0	3.76	T.
Savannah	67	20	43.2	5.82	T.
Sewanee	62	15	38.1	4.00	
Silverlake	57	12	33.7	4.10	7.5
Springdale	66	18	38.4	3.90	3.1
Springfield	67	16	38.8	2.55	T.
Tazewell	.....	.....	.....	3.73	3.0
Tellico Plains	69	21	42.0	6.58	T.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Tennessee—Cont'd.	°	°	°	*Ins.*	*Ins.*
Tracy City	63	16	37.8	4.93	T.
Tullahoma	65	16	38.7	4.60	T.
Union City	64	17	40.0	2.95	T.
Waynesboro	65	15	40.0	5.25	
Wildersville	65	20	42.0	4.28	T.
Yukon	65	18	40.1	5.08	
Texas.					
Alvin	.....	.....	.....	1.37	
Anna	77[e]	17[e]	48.5[e]	0.50[e]	
Anson	.....	.....	.....	0.05	
Austin *a*	82	22	53.3	0.20	
Austin *b*[*5]	73	23	50.7	.....	
Ballinger	75	17	47.2	0.16	0.8
Beaumont	75	40	58.0	1.00	
Bigspring	.....	.....	.....	0.11	
Blanco	76	22	48.4	0.42	
Boerne[*1]	76	24	52.3	0.47	
Booth	.....	.....	.....	1.33	
Bowie	79	13	48.2	0.31	
Brazoria	78	32	56.8	1.93	
Brenham	76	28	54.6	1.00	
Brighton	75	33	58.4	1.17	
Brownwood	77	30	50.1	0.35	T.
Burnet[*1]	74	24	53.1	0.38	
Camp Eagle Pass	87	25	54.8	0.00	
Coleman	80	19	50.9	0.11	1.10
Colorado	76[e]	13[e]	49.2[e]	0.14	
Columbia	77	27	55.2	0.92	
Corsicana	74	24	50.1	0.28	
Cuero	78	26	55.0	0 83	
Dallas	78	18	49.0	0.02	T.
Danevang	76	31	56.1	1.53	
Dublin	78	30	54.8	0.00	
Duval	73	26	54.1	0.42	
Estelle	79	19	50.2	0.27	
Fort Brown	82	30	56.8	0.30	
Fort McIntosh	86	.....	.....	0.75	
Fort Ringgold	86[j]	39[j]	64.2[j]	0.02[j]	
Fort Stockton	.....	.....	.....	0.53	
Fredericksburg[*1]	77[j]	24[j]	51.4[j]	0.88	
Gainesville	78[j]	17[e]	45.8[j]	0.62	
Grapevine	80	17	51.9	0.11	0.1
Greenville	78	19	49.7	0.26	
Hale Center	77	12	47.0	0.20	2.0
Hallettsville	77	30	56.0	0.48	
Haskell	83	14	47.4	0.02	
Hewitt	.....	.....	.....	0.05	
Hondo	.....	.....	.....	0.32	
Houston	.....	31	.....	2.16	
Huntsville	75	29	53.0	1.15	
Ira	82	13	48.4	0.10	T.
Jacksonville	75	22	52.4	1.96	
Jasper	80	28	56.6	1.95	
Kaufman	74	21	51.6	.....	
Kent	.....	.....	.....	0.08	
Kerrville	82	20	47.8	0.59	
Kopperl	.....	.....	.....	0.00	
Lampasas	79	21	51.8	0.40	
Langtry	80	29	53.6	0.00	
Laureles Ranch	.....	.....	.....	0.98	
Llano[*5]	80	23	53.2	0.40	
Longview	72	26	50.4	3.30	
Luling	79	24	54.6	0.72	
Mann	73	22	51.4	0.26	
Menardville	77	19	49.0	0.15	1.5
Nacogdoches	74	24	51.6	1.83	
New Braunfels	77	27	55.4	0.57	
Panter	.....	.....	.....	T.	
Paris *a*	95	19	51.6	0.64	
Rhineland	85	12	46.6	0.15	
Rockisland	77	32	56.2	1.14	
Rockport[*1]	76	40	61.1	0.47	
Runge	80[e]	27	56.8[e]	0.69	
Saginaw[*1]	76	19	50.1	0.09	
San Saba	81[k]	21[k]	53.4[k]	0.23	
Santa Gertrudes Ranch	.....	.....	.....	0.71	
Sherman	78	20	50.0	0.80	
Sugarland	79	29	57.0	0.50	
Temple *a*	74	23	51.6	0.75	
Temple *b*	73	24	51.1	0.57	
Trinity	75	26	54.9	1.22	
Tulia	77	3	40.8	0.10	1.0
Valentine	84	18	52.6	0.10	
Victoria	.....	.....	.....	1.44	
Waco	75	24	51.0	0.00	
Waxahachie	78	16	50.6	T.	
Weatherford	77	16	49.6	0.34	
Wichita Falls	.....	.....	.....	0.16	
Utah.					
Alpine	.....	.....	.....	0.96	1.0
Blackrock	53	− 8	29.5	0.40	3.5
Bluecreek[*1]	45	0	28.0	1.01	5.0
Castledale	50	− 9	24.0	0.25	2.5
Corinne	49	2	31.4	1.08	5.0
Deseret	54	− 8	30.7	0.10	1.5
Farmington	53	7	31.0	1.19	7.4

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Utah—Cont'd.	°	°	°	*Ins.*	*Ins.*
Fillmore	60	− 2	34.2	0.35	.....
Fishsprings	55[e]	5[e]	33 2[e]	0.22	2.0
Fort Duchesne	49	−13	22.0	0.25	2.0
Frisco	51	− 2	31.3	0.35	3.5
Giles	57	−12	27.8	0.18	2.0
Government Creek	.....	.....	.....	0.55	5.5
Green River	55	− 7	24.8	0.19	1.9
Grover	53	− 3	25.4	0.30	3.0
Heber	47	−11	23.7	2.20	4.0
Henefer	52	−26	22.0	1.12	8.8
Hite	58	9	36.7	.....	.....
Holyoake	58	3	32.4	1.06	0.5
Huntsville	.....	.....	.....	1.85	4.0
Kelton[*1]	45	− 6	28.4	0.30	T.
Levan	50	− 7	28.4	0.93	6.9
Loa	55	−19	19.1	T.	.....
Logan	47	− 1	28.3	1.13	
Lund	49	−12	29.0	0.15	1.3
Manti	55	−10	28.3	0.02	0.2
Meadowville	48	− 8	23.4	1.10	5.0
Millville	.....	.....	.....	1.33	.....
Minersville	54	− 1	31.8	0.45	3.3
Moab	57	2	31.0	0.32	2.0
Mount Pleasant	52	− 4	29.6	0.56	5.0
Ogden[*1]	51	7	32.4	0.71	5.0
Park City	48	− 5	25.0	2.24	22.4
Parowan	50	− 7	29.0	0.63	5.7
Pinto	50	−12	29.9	1.72	0.5
Promontory[*1]	49	− 2	24.6	0.27	2.7
Provo	57	− 6	31.2	0.22	.....
Richfield	51	0	24.4	0.60	6.0
St. George	64	− 1	36.9	0.75	.....
Scipio	57	−12	28.6	0.60	3.0
Snowville	44	−10	26.6	0.87	.....
Soldier Summit	43	.....	.....	0.85	8.5
Thistle	62	−20	28.5	.....	.....
Tooele	50	5	31.5	0.74	8.1
Tropic	48	−12	23.7	1.20	.....
Vernal	47	− 7	23.9	0.71	5.3
Wellington	.....	.....	.....	0.25	2.5
Woodruff	46	−24	14.0	.....	.....
Vermont.					
Bennington	46	−14	21.8	1.45	2.6
Burlington	39	−11	20 2	1.76	16.0
Chelsea	42	−22	15.4	2.58	27.0
Cornwall	41	−17	19.0	1.79	17.0
Derby	41	−27	13.8	2.44	24.4
Enosburg Falls	42	−29	13.0	5.17	48.9
Hartland	45	−25	16.6	2.22	20.4
Jacksonville	42	−20	17.8	2.10	27.0
Manchester	43	−11	20.1	1.35	11.5
Norwich	41	−26	14.6	2.29	19.0
St. Johnsbury	39	−31	12.9	2.06	23.5
Vernon[*6]	44	−22	20.2	1.93	21.0
Wells	44	−16	18.2	1.32	13.0
Woodstock	45	−28	18.6	2.06	25.0
Virginia.					
Alexandria	63	13	35.2	2.86	3.4
Ashland	70	14	38.1	3.11	5.0
Barboursville	70	23	39.0	2.73	4.2
Bedford	67	12	38.2	2.68	4.0
Bigstone Gap	61	15	35.4	4.33	6.3
Birdsnest	57	17	36.4	1.85	3.0
Blacksburg	64	11	33.0	2.85	6.0
Bon Air	77	13	37.4	3.79	3.5
Buckingham	70	10	35.8	3.49	2.9
Burkes Garden	57	5	31.8	4.07	10.0
Callaville	69	11	37.4	2.21	0.5
Charlottesville	69	12	37.8	2.74	4.5
Christiansburg	.....	.....	.....	1.74	2.0
Columbia	69	11	40.0	3.70	3.0
Dale Enterprise	65	8	33.9	2.04	4.0
Doswell	65	10	34.4	2.72	4.0
Farmville	68	10	39.0	2.93	2.0
Fredericksburg	65	15	37.0	3.09	5.0
Grahams Forge	59[e]	10[e]	35.0[e]	2.41	3.0
Hampton	66	21	41.6	2.82	1.2
Hot Springs	59	0	30.2	2.33	5.0
Lexington	69	13	36.2	3.00	4.2
Lincoln	63	20	32.8	1.70	T.
Manassas	64	10	34.6	2.23	4.5
Marion	64[j]	14[j]	35.4[j]	3.65	7.0
Meadowdale	.....	5	.....	1.88	9.5
Newport News	68	22	42.1	1.80	1.0
Petersburg	69	15	39.1	2.68	T.
Radford	.....	.....	.....	2.00	5.0
Rockymount	62	14	35.6	3.94	4.0
Salem	.....	.....	.....	2.20	5.0
Speers Ferry	.....	.....	.....	3.87	0.5
Spottsville	72	14	38.8	2.45	1.5
Stanardsville	61[l]	8	34.6[e]	1.62	4.0
Staunton	68	15	37.6	2.29	3.0
Stephens City	63	7	33.8	1.79	1.5
Warsaw	64	10	36.4	2.45	4.0
Westpoint	66	11	36.5	1.93	6.5
Williamsburg	69	14	39.4	1.99	T.

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Woodstock	53	10	31.8	2.45	2.0
Wytheville	66	13	35.1	2.45	5.0
Washington.					
Aberdeen	57	20	37.6	9.74	11.2
Anacortes	.....	.....	.....	3.23	5.0
Ashford	.....	.....	.....	8.34	18.5
Bremerton	53	24	39.5	8.36	15.0
Bridgeport	57	0	28.5	1.55	14.5
Brinnon	49	25	37.1	10.84	23.0
Cedonia	39	— 4	23.8	2.54	22.8
Centerville	48	7	28.5	5.10	10.0
Chehalis	50	24	38.6	3.61	
Cheney	.....	.....	.....	2.50	14.4
Clearwater	50	30	38.0	13.52	14.6
Cle Elum	50	8	28.4	4.78	19.5
Colfax	52	8	33.0	2.76	7.5
Colville	46	—14	25.6	1.83	14.7
Conconully	43	—10	21.7	2.37	27.2
Connell	.....	.....	.....	0.63	5.0
Coupeville	52	24	37.8	2.56	7.0
Crescent	42	— 3	27.0	1.65	9.5
Dayton	58	8	31.2	2.79	9.1
Ellensburg	48	2	28.6	1.97	7.2
Ellensburg (near)	44	2	28.0	1.85	8.5
Grandmound	52	23	38.5	6.62	9.8
Granite Falls	.....	.....	.....	4.36	5.4
Hooper	54	— 5	31.8	1.96	5.0
Issaquah	.....	.....	.....	6.14	4.5
Lacenter	55	26	37.9	6.96	17.5
Lakeside	48	2	27.3	2.13	12.5
Lind	45	— 6	28.0	1.36	8.3
Mayfield	50	24	35.3	6.27	8.0
Monte Cristo	46	13	31.2	.....	.....
Mottinger Ranch	56	15	35.2	0.90	2.3
Mount Pleasant	57	24	37.6	9.21	21.2
Moxee Valley	52	5	30.7	1.67	8.5
New Whatcom	55	9	37.8	3.97	11.3
Northport	.....	—12	.....	1.99	19.0
Olga	50	22	38.0	2.84	7.0
Olympia	53	26	39.7	8.57	.....
Pasco	55	10	32.6	0.84	0.3
Pinehill	58	16	35.0	6.72	25.2
Port Townsend	53	26	39.5	2.33	6.0
Pullman	47	12	31.1	0.81	8.1
Republic	48	—17	22.8	2.40	24.0
Ritzville	.....	.....	.....	1.13	5.0
Rosalia	48	5	30.4	2.55	9.4
Sedro	55	15	36.0	1.81	7.7
Silvana	54	17	37.4	5.43	10.7
Snohomish	52	21	37.4	4.50	7.5
Southbend	58	27	40.3	10.82	4.3
Sprague	.....	.....	.....	3.15	11.0
Sunnyside	55	6	30.7	0.86	3.8
Twin	55	24	38.0	7.87	4.5
Union	52	24	38.2	11.87	21.8
Usk	44	0	24.5	.....	.....
Vancouver	56	25	38.8	6.66	15.2
Waterville	45	—13	22.7	2.68	16.0
Wenatchee (near)	46	— 6	24.8	3.47	20.2
Wilbur	42	—12	24.1	1.57	15.2
West Virginia.					
Beckley	62	12	33.4	2.51	11.0
Beverly	57	0	32.2	3.87	21.0
Bluefield	62	9	34.3	3.35	16.0
Buckhannon	57	0	32.1	2.71	12.0
Burlington	60	5	32.2	1.95	2.0
Byrne	63	10	36.5	.....	.....
Cairo	60	8	35.6	2.10	9.0
Camden	60	10	37.2	2.45	10.6
Central	57	1	32.8	2.00	9.0
Chapel	50	12	30.4	4.79	18.2
Charleston	.....	.....	.....	2.10	5.5
Clay	65	12	35.5	.....	.....
Creston	61	6	33.8	2.15	10.0
Dayton	58	— 4	34.0	2.13	10.0
Eastbank	.....	14	.....	.....	.....
Elkhorn	62	14	37.4	3.77	14.0
Fairmont	.....	.....	.....	2.52	7.4
Glenville	62	2	33.4	3.11	15.9
Grafton	57	2	31.9	2.53	9.0
Green Sulphur	69	8	32.4	3.20	11.0
Harpers Ferry	.....	.....	.....	2.25	.....
Hinton *a*	.....	.....	.....	3.56	12.0
Huntington	65	14	31.4	1.56	6.8
Josiah	59	6	33.1	1.48	7.0
Lewisburg	63	7	32.4	3.29	9.9
Magnolia	61	6	33.1	1.60	2.0
Marlinton	57	2	30.0	3.58	9.3
Martinsburg	60	8	31.4	1.65	2.5
Morgantown	58	4	33.2	1.96	6.5
New Martinsville	58	7	34.6	2.07	10.3
Oceana	61	10	34.0	.....	.....
Parsons	56	0	30.9	2.60	10.0
Philippi *a*	57	— 3	31.1	3.55	20.7
Point Pleasant	62	10	37.4	1.50	4.0
Powelliton	68	13	34.8	2.97	9.3

Stations	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
West Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Princeton	59	9	34.6	5.95	14.5
Romney	60	7	33.2	1.81	1.5
Rowlesburg	.....	.....	.....	3.05	23.0
Southside	65	16	36.8	1.78	5.8
Spencer	64	5	35.4	2.56	13.5
Terra Alta	60	2	25.2	.....	.....
Uppertract	59	9	34.8	1.58	2.0
Wellsburg	53	5	29.9	1.75	6.0
Weston *a*	.....	.....	.....	2.49	12.2
Weston *b*	59	2	35.4	.....	.....
Wheeling *a*	.....	.....	.....	1.80	6.4
Wheeling *b*	61	15	35.4	4.66	8.5
Wiggins	69	18	36.6	.....	.....
Williamson	61	16	36.2	2.31	2.1
Winfield	64	14	35.7	1.43	3.0
Wisconsin.					
Amherst	44	—11	15.5	0.95	8.5
Ashland	.....	.....	.....	0.37	T.
Barron	46	—26	10.6	0.49	4.9
Bayfield	40	—12	17.1	0.10	1.0
Beloit	49	—11	22.8	1.44	10.2
Brodhead	50	—18	21.2	1.47	11.0
Butternut	41	—24	11.4	0.72	5.0
Citypoint	46	—12	16.1	0.65	10.5
Delavan	44	—11	19.9	0.75	8.7
Dodgeville	46	—21	19.7	0.74	10.0
Easton	47	—23	16.4	0.52	10.0
Eau Claire	45	—16	16.0	0.56	6.0
Florence	45	—15	14.6	0.55	6.0
Fond du Lac	44	—15	19.3	0.40	7.3
Grand River Locks	.....	.....	.....	0.36	8.0
Grantsburg	40	—31	11.8	0.50	5.0
Hartford	47	—19	20.5	1.31	9.5
Hartland	47	—12	20.2	0.72	9.5
Harvey	45	—12	20.5	1.09	8.7
Hayward	46	—31	12.0	0.94	9.5
Heafford	43	—23	12.2	0.60	6.0
Hillsboro	46	—17	17.2	0.80	8.0
Koepenick	.....	.....	.....	1.00	10.0
Lancaster	48	—17	19.4	0.66	8.5
Madison	44	— 9	20.2	0.62	8.3
Manitowoc	47	— 7	20.6	1.27	9.5
Meadow Valley	46	—15	16.2	.....	.....
Medford	44	—22	12.0	0.35	3.5
Menasha	.....	.....	.....	0.32	4.2
Neillsville	44	—19	15.2	0.50	5.0
New Holstein	41	— 7	20.2	0.51	5.1
New London	44	—12	17.6	0.58	4.5
Oconto	46	—11	18.9	1.45	14.5
Osceola	42	—29	10.8	0.38	4.0
Oshkosh	45	— 6	21.6	1.80	.....
Pepin	44	—17	14.4	0.49	6.0
Pine River	47	—15	16.6	0.50	9.0
Portage	47	—10	20.7	0.55	6.0
Port Washington	59	— 9	22.0	1.70	12.0
Prairie du Chien *a*	49	—11	23.2	0.77	8.2
Prairie du Chien *b*	.....	.....	.....	0.49	7.0
Racine	50	—10	24.6	0.83	.....
Shawano	42	—10	17.0	1.05	11.0
Sheboygan	46	— 8	22.1	1.00	10.0
Spooner	41	—30	11.5	0.21	1.6
Stevens Point	45	—15	17.0	0.73	7.3
Viroqua	43	—10	18.9	0.99	10.2
Watertown	45	—16	19.6	1.02	9.2
Waukesha	45	—15	20.6	1.02	7.3
Waupaca	43	—13	17.2	0.61	13.8
Wausaukee	.....	.....	.....	1.05	8.5
Westbend	40	—10	18.0	1.00	10.0
Westfield	46	—13	18.2	0.95	8.5
Whitehall	44	—12	17.4	0.42	6.6
Wyoming.					
Alcova	52	—18	29.4	0.10	1.0
Bedford	45	—21	19.6	1.24	12.4
Bitter Creek	60	—32	22.2	0.05	0.5
Buffalo	60	— 8	26.8	0.03	0.3
Burlington	47	—17	23.4	T.	T.
Casper	56	—20	31.6	0.10	1.5
Centennial	44	— 7	23.0	0.25	2.2
Chugwater	59	—22	28.0	0.10	1.0
Cody	65	1	30.6	0.10	1.0
Evanston	45	—14	17.6	0.58	5.2
Fort Laramie	61	—22	28.0	T.	T.
Fort Washakie	52	—28	23.2	0.20	2.0
Fort Yellowstone	41	—15	21.4	2.28	22.8
Fourbear	59	—22	24.6	0.13	6.0
Griggs	60	—18	25.5	0.16	2.0
Hyattville	52	—18	26.3	0.00	
Iron Mountain	56	—11	29.2	0.03	0.3
Laramie	48	—19	19.2	0.04	0.4
Lovell	59	0	24.3	T.	T.
Lusk	54	—18	25.4	0.00	
Myersville	49	.....	.....	T.	T.
Pinebluff	63	—19	28.6	T.	T.
Rawlins	46	— 8	25.0	0.25	2.5
Saratoga	49	—10	24.8	0.50	5.0
Sheridan	60	—19	23.3	0.15	1.5

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Wyoming—Cont'd.	°	°	°	*Ins.*	*Ins.*
South Pass City	44	—22	17.5	0.38	3.8
Spring Hill	46	.....	.....	1.00	10.0
Wheatland	.....	.....	.....	0.05	0.5
Cuba.					
Aguacate	90	38	67.6	1.91	
Alvarez	.....	.....	.....	1.92	
Anstralia	87	57	68.4	0.47	
Banaguises	89	42	69.8	1.87	
Batabano	80	44	67.3	0.80	
Cruces	.....	.....	.....	1.12	
Gibara	90	49	71.2	2.77	
Guabairo	.....	.....	.....	2.65	
Guanajay	83	52	67.9	2.73	
Guantanamo	89	46	72.4	0.42	
Guines	90	67	80.1	1.62	
Holguin	85	49	71.7	0.95	
Isabel, Guantanamo	.....	.....	.....	1.15	
Los Canos	91	43	72.4	0.89	
Magdalena	88	42	68.6	0.75	
Manzanillo	80	69	78.6	0.55	
Matanzas	87	40	68.1	2.35	
Moron Trocha	90	45	71.5	0.50	
Numero	87	53	71.0	0.89	
Pinar del Rio	85	50	68.9	1.43	
Romelie, Guantanamo	.....	.....	.....	1.54	
Sagua la Grande	87	47	69.1	0.78	
Santa Clara	89	45	68.8	0.46	
Sancti Spiritus	87	57	72.6	1.12	
Santa Cruz del Sur	87	52	73.0	.....	
Soledad	86	47	69.2	1.61	
Soledad, Guantanamo	91	44	72.7	1.68	
Yaguajay	90	52	71.1	0.68	
Yateras	.....	.....	.....	0.89	
Porto Rico.					
Adjuntas	.....	.....	.....	6.19	
Aguadilla	88	59	72.7	2.51	
Arecibo	85	59	72.0	3.04	
Bayamon	92	55	74.6	3.50	
Canovanas	85	61	74.8	2.98	
Cayey	96	52	73.1	4.99	
Cidra	86	55	70.9	7.47	
Coamo	91	58	76.4	14.20	
Comerio	89	50	73.0	5.19	
Corozal	89	51	71.8	6.11	
Fajardo	89	59	76.5	6.07	
Hacienda Coloso	89	55	73.7	2.45	
Hacienda Perla	87	61	74.8	5.57	
Humacao	92	54	74.4	5.67	
Isabela	87	61	75.3	3.52	
Juana Diaz	95	55	76.0	3.85	
La Isolina	86	58	72.0	7.06	
Lajas	89	53	74.6	2.60	
Manati	91	57	74.6	5.64	
Maunabo	86	70	78.3	6.57	
Mayaguez	91	61	76.6	2.19	
Morovis	87	56	72.0	6.25	
Ponce	.....	.....	.....	2.38	
Salinas	.....	.....	.....	0.96	
San Lorenzo	90	54	73.4	6.36	
Utuado	86	56	72.4	4.09	
Vieques	90	63	77.6	5.74	
Yauco	90	59	74.0	3.04	
Mexico					
Ciudad P. Diaz	80	30	56.1	0.29	
Coatzacoalcos	88	56	70.4	9.19	
Leon de Aldamas	76	37	56.4	0.03	
Puebla	75	38	56.3	.....	
Tampico	78	46	64.6	0.28	
Topolobampo	86	29	63.3	0.20	
Vera Cruz	83	60	70.4	0.45	
Nicaragua.					
Rivas	87	74	80.2	T.	

Late reports for December, 1900.

Alaska.					
Fort Liscum	39	— 8	21.6	4.82	32.5
California.					
Branscomb	.....	.....	.....	13.90	
Glendora	.....	.....	.....	0.00	
Illinois.					
Glenwood	.....	.....	.....	0.17	
Round Grove	47	1	24.1	0.23	1.1
Iowa.					
Bussey	.....	.....	.....	1.10	2.0
Knoxville	55	— 6	27.2	0.50	2.0
Kansas.					
Hays	65	— 8	34.0	0.22	
Maine.					
Calais	40	—10	19.0	2.05	19.0
Michigan.					
West Branch	50	1	25.6	0.49	4.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Montana.	°	°	°	*Ins.*	*Ins.*
Lewistown	61	−10	30.8	0.90	9.0
Nebraska.					
Franklin	71	− 8	34.5	0.10	1.0
Merriam	.....	.....	.....	0.00	
Nevada.					
Verdi*[1]	62	0	34.6	1.15	7.0
New Mexico.					
Hillsboro	60	20	40.2	0.30	3.0
New York.					
Hemlock Lake	50	2	30.2	1.73	8.5
North Carolina.					
Washington	68	20	46.6	5.63	
Ohio.					
Bellefontaine	51	9	28.5	.....	
Pennsylvania.					
Confluence	55	5	29.6	2.15	3.3
Warren	49	− 1	27.8	2.17	13.8
Williamsport	49	9	31.6	2.15	T.
South Dakota.					
Sioux Falls	50	−16	17.4	0.55	5.5
Tennessee.					
Peryear	.....	.....	.....	2.66	
Waynesboro	64	21	40.8	2.21	
Texas.					
Rhineland	74	14	46.0	0.32	
Utah.					
Meadowville	55	−11	28.4	0.41	1.1
Washington.					
Wilbur	52	9	35.2	3.51	.....
Porto Rico.					
Salinas	.....	.....	.....	0.57	
Nicaragua.					
Rivas	89	75	82.5	1.31	
Isthmus of Panama.					
Alhajuela	90	68	78.1	1.14	
La Boca	89	73	80.2	.....	

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. + 4.

[2] Mean of 8 a. m. + 8 p. m. + 2.

[3] Mean of 7 a. m. + 7 p. m. + 2.

[4] Mean of 6 a. m. + 6 p. m. + 2.

[5] Mean of 7 a. m. + 2 p. m. + 2.

[6] Mean of readings at various hours reduced to true daily mean by special tables.

[7] Mean from hourly readings of thermograph.

[9] Mean of sunrise and noon.

[10] Mean of sunrise, noon, sunset, and midnight.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance "*a*" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

October, 1900, Alaska, Coal Harbor, page 456, strike out all data and enter 60, 25, 43.4, 5.35.

December, 1900, Tucson, Ariz., make minimum temperature 25 instead of 28, and mean temperature 51.6 instead of 52.4.

NOTE.—The following changes have been made in the names of stations: California, Deweyville changed to Wa-co; Lankershim changed to Storey. Mississippi, Logtown changed to Pearlington. Nevada, Duck Valley changed to Owyhee; Empire Ranch changed to Potts.

January, 1901, on page 7, in last line of 5th column of table, make 467.77 read 465.77.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of January, 1901.*

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	31	7	11	26	n. 32 w.	28
Portland, Me	29	12	2	31	n. 60 w.	34
Northfield, Vt	27	29	2	6	s. 63 w.	4
Boston, Mass	25	13	5	31	n. 65 w.	29
Nantucket, Mass	25	10	10	22	n. 34 w.	18
Block Island, R. I	30	7	11	30	n. 40 w.	30
New Haven, Conn	32	8	5	27	n. 37 w.	36
Middle Atlantic States.						
Albany, N. Y	31	14	3	22	n. 48 w.	26
Binghamton, N. Y †	16	4	5	13	n. 34 w.	14
New York, N. Y	29	10	9	32	n. 50 w.	30
Harrisburg, Pa †	12	4	9	12	n. 21 w.	8
Philadelphia, Pa	30	14	11	26	n. 43 w.	22
Scranton, Pa	31	13	17	19	n. 6 w.	18
Atlantic City, N. J	32	11	8	26	n. 41 w.	28
Cape May, N. J	29	12	9	26	n. 45 w.	24
Baltimore, Md	19	10	13	30	n. 62 w.	19
Washington, D. C	29	15	14	23	n 33 w.	16
Lynchburg, Va	19	19	8	35	w.	27
Norfolk, Va	24	20	10	18	n. 63 w.	9
Richmond, Va	25	21	7	21	n. 74 w.	15
South Atlantic States.						
Charlotte, N. C	19	23	13	30	s. 60 w.	8
Hatteras, N. C	33	11	6	26	n. 42 w.	30
Raleigh, N. C	24	15	7	29	n. 68 w.	24
Wilmington, N. C	26	12	12	26	n. 45 w.	20
Charleston, S. C	28	10	10	25	n. 40 w.	23
Augusta, Ga	23	12	11	32	n. 62 w.	24
Savannah, Ga	25	13	9	28	n. 58 w.	22
Jacksonville, Fla	29	11	10	23	n. 36 w	22
Florida Peninsula.						
Jupiter, Fla	21	11	14	30	n. 58 w.	19
Key West, Fla	33	9	31	5	n. 47 e.	35
Tampa, Fla	33	11	13	24	n. 26 w	25
Eastern Gulf States.						
Atlanta, Ga	27	9	14	30	n. 42 w.	24
Macon, Ga †	14	7	6	13	n. 45 w.	10
Pensacola, Fla †	18	3	7	8	n. 4 w.	15
Mobile, Ala	29	22	8	16	n. 49 w.	11
Montgomery, Ala	26	14	14	18	n. 18 w.	13
Meridian, Miss †	13	7	6	11	n. 40 w.	8
Vicksburg, Miss	22	21	20	16	n. 76 e.	4
New Orleans, La	23	16	17	17	n.	7
Western Gulf States.						
Shreveport, La	16	31	9	15	n. 22 w.	16
Fort Smith, Ark	19	13	24	19	n. 40 e.	8
Little Rock, Ark	18	22	13	26	n. 65 w.	14
Corpus Christi, Tex	24	25	21	7	s. 86 e.	14
Fort Worth, Tex †	23	27	7	15	s. 63 w.	9
Galveston, Tex	20	24	25	9	s. 76 e.	16
Palestine, Tex	18	30	7	19	s. 45 w.	17
San Antonio, Tex	23	28	16	3	s. 69 e.	14
Ohio Valley and Tennessee.						
Chattanooga, Tenn	26	19	11	24	n. 62 w.	15
Knoxville, Tenn	22	30	13	27	n. 82 w.	14
Memphis, Tenn	22	26	11	17	s. 56 w.	7
Nashville, Tenn	23	21	10	24	n. 82 w.	14
Lexington, Ky	7	13	5	13	s. 58 w.	9
Louisville, Ky	19	23	10	28	s. 73 w.	14
Evansville, Ind †	12	10	7	9	n. 45 w.	3
Indianapolis, Ind	15	22	10	29	s. 70 w.	20
Cincinnati, Ohio	16	19	16	25	s. 72 w.	10
Columbus, Ohio	10	21	15	27	s. 47 w	16
Pittsburg, Pa	23	17	5	33	n. 78 w.	29
Parkersburg, W. Va	18	23	5	27	s. 77 w.	23
Elkins, W. Va	18	15	4	34	n. 84 w.	30
Lower Lake Region.						
Buffalo, N. Y	14	17	8	35	s. 84 w.	27
Oswego, N. Y	19	27	17	19	s. 14 w.	8
Rochester, N. Y	12	27	8	33	s. 59 w.	29
Erie, Pa	19	22	4	33	s. 84 w.	29
Cleveland, Ohio	13	28	11	24	s. 41 w.	30
Sandusky, Ohio	15	23	5	34	s. 75 w.	30
Toledo, Ohio	15	24	8	27	s. 65 w.	21
Detroit, Mich	17	22	6	30	s. 78 w.	24
Upper Lake Region.						
Alpena, Mich	14	17	5	38	s. 85 w.	33
Escanaba, Mich	18	17	2	37	n. 88 w.	35
Grand Haven, Mich	26	15	13	20	n. 32 w.	13
Houghton, Mich. †	9	6	7	13	n. 65 w.	7
Marquette, Mich	16	21	3	36	s. 81 w.	33
Port Huron, Mich	16	25	3	32	s. 73 w.	30
Sault Ste. Marie, Mich	16	15	23	23	n.	1
Chicago, Ill	18	21	5	33	s. 65 w.	31
Milwaukee, Wis	21	16	3	33	n. 81 w.	30
Green Bay, Wis	9	28	5	28	s. 50 w.	30
Duluth, Minn	21	16	6	34	n. 80 w.	28
North Dakota.						
Moorhead, Minn	22	17	15	27	n. 67 w.	13
Bismarck, N. Dak	23	8	17	29	n 39 w.	17
Williston, N. Dak	16	16	9	25	w.	16
Upper Mississippi Valley.						
St. Paul, Minn	24	18	12	26	n. 67 w.	15

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
Upper Mississippi Valley.—Cont'd.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
La Crosse, Wis †	12	13	2	11	s. 84 w.	9
Davenport, Iowa	16	16	12	33	w.	21
Des Moines, Iowa	25	17	16	23	n. 41 w.	11
Dubuque, Iowa	19	18	15	28	n. 86 w.	13
Keokuk, Iowa	15	22	13	30	s. 68 w.	18
Cairo, Ill	21	23	12	20	s. 76 w.	8
Springfield, Ill	8	21	8	31	s. 61 w.	26
Hannibal, Mo †	7	12	4	15	s. 66 w.	12
St. Louis, Mo	17	20	11	25	s 78 w.	14
Missouri Valley.						
Columbia, Mo *	11	10	5	14	n. 84 w.	9
Kansas City, Mo	20	24	8	24	s. 76 w.	16
Springfield, Mo	19	22	12	23	s 75 w.	11
Lincoln, Nebr	25	24	8	16	n. 83 w.	8
Omaha, Nebr	24	21	10	19	n 72 w	10
Valentine, Nebr	25	14	4	35	n. 70 w.	33
Sioux City, Iowa †	11	9	7	12	n. 68 w.	5
Pierre, S. Dak	22	11	22	21	n. 5 e.	11
Huron, S. Dak	22	17	16	26	n. 63 w.	11
Yankton, S. Dak †	11	3	7	14	n. 41 w.	11
Northern Slope.						
Havre, Mont	14	18	12	34	s. 80 w.	22
Miles City, Mont	21	25	6	23	s 77 w.	18
Helena, Mont	10	24	1	46	s. 73 w.	47
Kalispell, Mont	14	14	4	43	w.	39
Rapid City, S. Dak	20	8	11	36	n 64 w.	28
Cheyenne, Wyo	22	11	3	40	n. 74 w.	39
Lander, Wyo	14	27	16	25	s. 35 w.	16
North Platte, Nebr	13	19	8	35	s. 78 w	28
Middle Slope.						
Denver, Colo	17	30	8	23	s. 49 w.	30
Pueblo, Colo	23	7	16	28	n. 37 w.	20
Concordia, Kans	20	23	8	22	s. 78 w.	14
Dodge, Kans	31	15	10	19	n. 29 w.	18
Wichita, Kans	32	21	7	12	n. 24 w.	12
Oklahoma, Okla	30	22	5	13	n. 45 w.	11
Southern Slope.						
Abilene, Tex	16	33	13	15	s. 7 w.	17
Amarillo, Tex	18	23	15	23	s. 58 w	9
Southern Plateau.						
El Paso, Tex	22	9	14	32	n 54 w.	22
Santa Fe, N. Mex	31	13	23	10	n. 36 e.	22
Flagstaff, Ariz	15	16	19	27	s. 83 w.	8
Phoenix, Ariz	14	15	27	17	s. 84 e.	10
Yuma, Ariz	33	13	16	19	n. 11 e.	21
Independence, Cal	32	13	7	27	n. 46 w.	28
Middle Plateau.						
Carson City, Nev	13	28	12	19	s. 25 w.	17
Winnemucca, Nev	19	17	17	21	n. 64 w.	4
Modena, Utah	8	19	18	32	s. 52 w.	18
Salt Lake City, Utah	11	28	12	20	s. 25 w.	9
Grand Junction, Colo	18	14	17	28	n. 70 w.	12
Northern Plateau.						
Baker City, Oreg	10	38	10	17	s. 14 w.	29
Boise, Idaho	13	23	22	21	s. 6 e.	10
Lewiston, Idaho †	2	12	16	6	s. 45 e.	14
Pocatello, Idaho	10	35	13	14	s. 2 w.	25
Spokane, Wash	15	29	18	14	s. 16 e.	15
Walla Walla, Wash	4	44	7	12	s. 7 w.	40
North Pacific Coast Region.						
Neah Bay, Wash	2	22	29	22	s. 19 e.	21
Port Crescent, Wash *	0	13	15	11	s. 17 e.	14
Seattle, Wash	19	30	27	4	s. 64 e.	26
Tacoma, Wash	12	33	16	14	s. 5 e.	21
Astoria	13	16	31	17	s. 78 e.	14
Portland, Oreg	16	30	14	19	s. 30 w.	15
Roseburg, Oreg	19	22	15	43	s. 69 w.	8
Middle Pacific Coast Region.						
Eureka, Cal	18	27	19	13	s. 34 e.	11
Mount Tamalpais, Cal	29	19	18	13	n. 27 e.	11
Red Bluff, Cal	39	12	11	8	n. 6 e.	27
Sacramento, Cal	25	25	17	8	e.	9
San Francisco, Cal	26	13	13	24	n. 40 w.	17
South Pacific Coast Region.						
Fresno, Cal	21	11	23	21	n. 11 e.	10
Los Angeles, Cal	26	7	23	18	n. 15 e.	20
San Diego, Cal	29	11	16	22	n. 37 w.	10
San Luis Obispo, Cal	32	19	3	13	n. 38 w.	16
West Indies.						
Basseterre, St. Kitts Island	28	7	36	1	n. 59 e.	41
Bridgetown, Barbados	14	12	51	0	n. 51 e.	88
Cienfuegos, Cuba	41	4	33	4	n. 38 e.	47
Grand Turk, Turks Island, W. I †	13	6	13	7	n. 49 e.	11
Havana, Cuba	24	5	34	9	n. 53 e.	31
Kingston, Jamaica	48	0	30	0	n. 32 e.	56
Port of Spain, Trinidad	10	7	52	1	n. 87 e.	51
Puerto Principe, Cuba	41	6	29	7	n. 33 e.	41
Roseau, Dominica, W. I	19	7	41	6	n. 71 e.	37
San Juan, Porto Rico	9	24	37	6	s. 64 e.	34
Santiago de Cuba, Cuba	34	12	29	1	n. 52 e.	36
Santo Domingo, S. Domingo, W. I.	51	5	8	4	n. 5 e.	46
Willemstad, Curaçao	4	2	59	0	n. 88 e.	60

* From observations at 8 p. m. only.

† From observations at 8 a. m. only.

TABLE IV.—*Thunderstorms and auroras, January*, 1901.

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	52	T.										3	3					3							1						1	2		13	6	T
		A.																																0	0	A
Arizona	56	T.									1																							1	1	T.
		A.																																0	0	A.
Arkansas	57	T.										1	1												5	2								9	4	T.
		A.																																0	0	A.
California	167	T.	1		1									1									1			4								8	5	T.
		A.																																0	0	A.
Colorado	81	T.																																0	0	T.
		A.		1	1																													2	2	A.
Connecticut	21	T.																																0	1	T.
		A.																					1											1	1	A.
Delaware	5	T.																																0	0	T.
		A.																																0	0	A.
Dist. of Columbia	4	T.																																0	0	T.
		A.																																0	0	A.
Florida	47	T.	1	2															1													1	1	6	5	T.
		A.																																0	0	A.
Georgia	55	T.		1								1																			1	2		5	4	T.
		A.																																0	0	A.
Idaho	34	T.																																0	0	T.
		A.																		1														1	2	A.
Illinois	92	T.																						1	3									4	2	T.
		A.																					1											1	1	A.
Indiana	58	T.							1														1											2	2	T.
		A.																																0	0	A.
Indian Territory	11	T.									1																							1	1	T.
		A.																																0	0	A.
Iowa	149	T.																						2	6									8	2	T.
		A.																																0	0	A.
Kansas	77	T.									6																							6	1	T.
		A.																																0	0	A.
Kentucky	41	T.																					3		1									4	2	T.
		A.																		1														1	1	A.
Louisiana	46	T.	5								3	3	1					1															1	14	6	T.
		A.																																0	0	A.
Maine	19	T.																																0	0	T.
		A.																					1	1										2	2	A.
Maryland	48	T.																								2								2	1	T.
		A.									1					1	1													1				4	4	A.
Massachusetts	48	T.																																0	0	T.
		A.																																1	1	A.
Michigan	106	T.								1																								0	0	T.
		A.																																0	0	A.
Minnesota	67	T.																																0	0	T.
		A.																					1	1										2	2	A.
Mississippi	41	T.										3	1																1		2			7	4	T.
		A.																																0	0	A.
Missouri	93	T.									3													23	10									36	3	T.
		A.			1														1															2	2	A.
Montana	40	T.														3																		3	1	T.
		A.																																0	0	A.
Nebraska	142	T.																2	2															4	2	T.
		A.																																0	0	A.
Nevada	40	T.																																0	0	T.
		A.																																0	0	A.
New Hampshire	19	T.																																0	0	T.
		A.																						2										2	1	A.
New Jersey	51	T.																																0	0	T.
		A.													1																			1	1	A.
New Mexico	81	T.																	1															2	2	T.
		A.																																0	0	A.
New York	99	T.																																0	0	T.
		A.																					1	2										3	2	A.
North Carolina	56	T.																1					1		1	3			2					8	5	T.
		A.																																0	0	A.
North Dakota	48	T.																																0	0	T.
		A.			1																		1	6				1		1				10	5	A.
Ohio	128	T.																					8											8	1	T.
		A.																																0	0	A.
Oklahoma	23	T.									1																					1		2	2	T.
		A.																																0	0	A.
Oregon	74	T.	7		1									1																				9	3	T.
		A.																																0	0	A.
Pennsylvania	91	T.																																0	0	T.
		A.																																0	0	A.
Rhode Island	7	T.																																0	0	T.
		A.																																0	0	A.
South Carolina	46	T.																																0	0	T.
		A.																																0	0	A.
South Dakota	56	T.																						2										2	1	T.
		A.																																0	0	A.
Tennessee	56	T.																							8	4								12	2	T.
		A.																																0	0	A.
Texas	95	T.									1	2																			1			4	3	T.
		A.																																0	0	A.
Utah	47	T.							3														3											6	2	T.
		A.																																0	0	A.
Vermont	16	T.																																0	0	T.
		A.																																0	0	A.
Virginia	50	T.																								2								2	1	T.
		A.																																0	0	A.
Washington	64	T.												2	3	2																		7	3	T.
		A.																																0	0	A.
West Virginia	43	T.																								14								14	1	T.
		A.																																0	0	A.
Wisconsin	60	T.																																0	0	T.
		A.																																0	0	A.
Wyoming	31	T.																																0	0	T.
		A.																																0	0	A.
Sums	2,893	T	14	3	2	0	0	0	4	1	16	13	6	3	4	5	0	7	4	0	0	0	17	28	35	31	0	0	3	1	4	8	1	210	...	T
		A	0	1	3	0	0	0	0	0	1	0	0	0	1	1	1	0	1	2	0	0	5	13	0	0	0	1	0	2	0	0	0	32	....	A

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during January, 1901, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration.		Total am't of precipitation.	Excessive rate.		Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated.													
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	11-12			0.74														*			
Alpena, Mich.	10			0.40														*			
Atlanta, Ga.	10-12			3.20														0.54			
Atlantic City, N. J.	10-12			2.09														0.24			
Baltimore, Md.	10-12			1.69														0.16			
Binghamton, N. Y.	11-12			0.30														0.04			
Bismarck, N. Dak.	15			0.01																	
Boise, Idaho	6-7			0.32														0.14			
Boston, Mass.	11-12			0.88														0.12			
Buffalo, N. Y.	8			0.45														0.19			
Cairo, Ill.	23			0.49														0.40			
Charleston, S. C.	3-4			0.87														0.10			
Chicago, Ill.	9			0.35														*			
Cincinnati, Ohio	10			0.20														0.10			
Cleveland, Ohio	11-12			0.38														0.07			
Columbia, Mo.	9			1.97														*			
Columbus, Ohio	23			0.17														0.12			
Denver, Colo.	29-30			0.05														*			
Des Moines, Iowa	9-10			0.59														0.13			
Detroit, Mich.	9-10			0.53														*			
Dodge, Kans.	9			0.13														*			
Duluth, Minn.	5-6			0.15														*			
Eastport, Me.	24			1.08														0.27			
Elkins, W. Va.	10-11			1.34														0.37			
Erie, Pa.	11-12			0.28														*			
Escanaba, Mich.	6			0.25														*			
Evansville, Ind.	9-10			0.38														0.24			
Fort Worth, Tex.	29			0.06														0.06			
Fresno, Cal.	6-7			0.61														*			
Galveston, Tex.	21			0.15													0.15				
Grand Junction, Colo.	25-26			0.36														*			
Harrisburg, Pa.	11-12			0.69														0.10			
Hatteras, N. C.	2-3			0.90														0.17			
Huron, S. Dak.	9-10			0.11														*			
Indianapolis, Ind.	9-10			0.42														0.19			
Jacksonville, Fla.	30-31			0.69														0.35			
Jupiter, Fla.	21-22	6.00 p. m.	11.04 a. m.	4.72	6.00 a. m.	7.30 a. m.	0.48	0.13	0.25	0.33	0.42	0.49	0.55	0.61	0.65	0.68	0.72	1.11	1.53	1.76	
Kalispell, Mont.	3-4			0.25														*			
Kansas City, Mo.	9			0.36														*			
Key West, Fla.	17			0.28														0.27			
Knoxville, Tenn.	10-11			3.19														0.31			
Lexington, Ky.	10			0.40														0.17			
Lincoln, Nebr.	9			0.19														*			
Little Rock, Ark.	9-10			1.11														0.53			
Los Angeles, Cal.	27			0.67														0.22			
Louisville, Ky.	10			0.26														0.14			
Macon, Ga.	11-12			0.48														0.29			
Memphis, Tenn.	23-24	10.10 p. m.	2.00 a. m.	1.34	10.20 p. m.	10.50 p. m.	0.04	0.05	0.10	0.32	0.55	0.70	0.78	0.81							
Meridian, Miss.	11			2.23														0.83			
Milwaukee, Wis.	9-10			0.54														0.08			
Montgomery, Ala.	11-12			1.75														0.75			
Nantucket, Mass.	11-12			0.99														0.08			
Nashville, Tenn.	23			1.03														0.65			
New Haven, Conn.	11-12			0.69														*			
New Orleans, La.	9			0.87														0.74			
New York, N. Y.	11-12			1.24														0.12			
Norfolk, Va.	11			0.40														0.15			
Northfield, Vt.	16			0.40														0.17			
Oklahoma, Okla.	9			0.51														*			
Omaha, Nebr.	9			0.21														0.07			
Parkersburg, W. Va.	16			0.12														0.12			
Philadelphia, Pa.	11-12			1.12														0.09			
Pittsburg, Pa.	9-10			0.45														*			
Pocatello, Idaho	6-7			0.28														*			
Portland, Me.	15-16			0.44														0.12			
Portland, Oreg.	12-13			2.01														0.50			
Pueblo, Colo.	29-30			0.21														*			
Raleigh, N. C.	11-12			0.57														0.23			
Richmond, Va.	11-12			1.20														0.24			
Rochester, N. Y.	10			0.50														0.13			
St. Louis, Mo.	9			0.54														*			
St. Paul, Minn.	9-10			0.24														0.16			
Salt Lake City, Utah.	7			0.46														*			
San Diego, Cal.	7			0.61														0.30			
Sandusky, Ohio	11-12			0.38														*			
San Francisco, Cal.	6			1.75														0.41			
Savannah, Ga.	30			0.91														0.59			
Seattle, Wash.	12-13			1.26														0.21			
Spokane, Wash.	14			0.55														*			
Tampa, Fla.	17			0.54														0.35			
Toledo, Ohio	9-10			0.35														*			
Topeka, Kans.	9			0.11														*			
Vicksburg, Miss.	10-11	†	†	8.00	‡	‡	3.25	0.06	0.16	0.25	0.33	0.41	0.50	0.62	0.77	0.96	1.03	1.05			
					§	§	5.11	0.06	0.23	0.31	0.40	0.54	0.62	0.82	0.88	0.93	0.95	0.97	1.02	1.10	1.18
Washington, D. C.	11-12			1.67														0.17			
Wilmington, N. C.	2-3			0.89														0.18			
Yankton, S. Dak.	8-9			0.18														*			
Basseterre, St. Kitts.	20-21			0.94														0.22			
Bridgetown, Barbados	14			0.78														0.38			
Cienfuegos, Cuba	5	4.20 p. m.	7.00 p. m.	0.77	4.28 p. m.	4.45 p. m.	0.02	0.16	0.40	0.54	0.58										
	13	4.30 p. m.	7.30 p. m.	0.88	4.45 p. m.	5.15 p. m.	T	0.14	0.23	0.42	0.51	0.69	0.74								
Havana, Cuba	5	6.20 a. m.	7.08 p. m.	5.36	9.05 a. m.	9.55 a. m.	0.55	0.12	0.23	0.29	0.40	0.43	0.53	0.60	0.62	0.64	0.71				
					9.55 a. m.	10.45 a. m.		0.86	1.07	1.24	1.45	1.67	1.74	1.87	1.93	2.01	2.10				
					10.45 a. m.	11.35 p. m.		2.15	2.18	2.20	2.24	2.33	2.49	2.70	2.91	3.11	3.22	3.30	3.58		
	17	4.17 p. m.	6.45 p. m.	1.32	5.15 p. m.	5.45 p. m.	0.33	0.06	0.15	0.32	0.53	0.69	0.81	0.84	0.86	0.89					
Kingston, Jamaica	18-19			0.99														0.64			
Port of Spain, Trin.	15			0.56														0.45			
Puerto Principe, Cuba	8			0.12					0.08												
Roseau, Dominica	10-11			0.86														0.21			
San Juan, Porto Rico.	7	6.30 a. m.	7.23 p. m.	1.38	1.01 p. m.	1.25 p. m.	0.07	0.21	0.54	0.96	1.13	1.17	1.19								
Santiago de Cuba	22	5.26 p. m.	8.19 p. m.	2.84	5.42 p. m.	6.35 p. m.	0.02	0.11	0.22	0.38	0.77	1.27	1.68	1.80	1.83	1.87	1.95	1.99	2.04	2.37	2.57
Santo Domingo, S. D.	7			0.66														0.65			
Willemstad, Curaçao	6			0.40								0.36									

*Self register out of order. †4.30 a. m. of 10th to 10 p. m. of 11th. ‡12.25 p. m. to 1.15 p. m. of 10th. §8.25 p. m. to 9.05 p. m. of 10th.

TABLE VI.—*Data furnished by the Canadian Meteorological Service, January*, 1901.

Stations.	Pressure.			Temperature.				Precipitation.			Stations.	Pressure.			Temperature.				Precipitation.		
	Mean not reduced.	Mean reduced.	Departure from normal.	Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Total.	Departure from normal.	Depth of snow.		Mean not reduced.	Mean reduced.	Departure from normal.	Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Total.	Departure from normal.	Depth of snow.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*		*Ins.*	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
St. Johns, N. F.	29.66	29.81	—.08	21.6	— 2.2	28.9	14.3	7.08	+1.14	2.3	Parry Sound, Ont	29.24	29.98	—.10	16.1	+ 2.3	27.0	5.3	3.92	+0.77	35.0
Sydney, C. B. I.	29.83	29.87	—.07	23.4	+ 2.9	31.6	15.1	6.98	+2.17	9.0	Port Arthur, Ont.	29.26	30.01	—.10	7.6	+ 4.5	18.8	— 3.5	0.84	+0.03	8.4
Halifax, N. S.	29.77	29.89	—.07	24.3	+ 2.5	32.4	16.2	6.74	+1.05	32.4	Winnipeg, Man.	29.21	30.13	—.06	—3.5	+ 3.3	7.6	—14.5	0.81	+0.15	8.1
Grand Manan, N. B.	29.85	29.90	—.09	23.1	— 0.3	30.9	15.3	7.64	+2.27	35.4	Minnedosa, Man.	28.12	30.10	—.07	—0.6	+ 6.6	9.4	—10.6	0.90	+0.27	9.0
Yarmouth, N. S.	29.84	29.90	—.12	26.3	0.0	33.2	19.4	5.06	—0.16	20.3	Qu'Appelle, Assin.	27.62	30.07	—.10	2.0	+ 5.8	10.0	— 5.9	2.28	+1.90	22.8
Charlottet'n, P. E. I.	29.84	29.87	—.09	19.2	+ 2.2	27.9	10.6	2.82	—0.59	11.4	Medicine Hat, Assin.	27.64	30.07	—.12	15.4	+ 9.9	24.9	5.9	1.68	+1.35	16.8
Chatham, N. B.	29.87	29.89	—.13	13.2	+ 3.4	21.6	2.8	4.58	+1.30	22.3	Swift Current, Assin.	27.33	30.09	—.10	9.3	+ 6.2	18.0	0.6	1.32	+0.71	13.2
Father Point, Que.	29.89	29.92	—.11	10.7	+ 2.7	19.2	2.2	1.64	—1.06	16.4	Calgary, Alberta	26.27	29.98	—.21	16.6	+ 8.2	25.7	7.4	0.40	—0.17	4.0
Quebec, Que.	29.61	29.97	—.09	10.7	+ 1.6	18.8	2.6	2.78	—0.89	27.8	Banff, Alberta	25.22	30.10	—.05	14.3	+ 2.2	21.6	7.1	0.88	—0.42	8.8
Montreal, Que.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Edmonton, Alberta	27.53	29.97	—.18	13.0	+11.2	28.2	2.8	0.46	—0.27	4.6
Bissett, Ont.	29.38	30.04	—.02	5.0	— 1.4	17.7	— 7.7	1.83	—0.18	18.3	Prince Albert, Sask.	28.37	30.07	—.08	—4.2	+ 4.2	5.9	—14.3	0.33	—0.63	3.3
Ottawa, Ont.	29.61	29.95	—.12	11.7	+ 2.1	21.6	1.8	3.31	+0.31	31.1	Battleford, Sask.	28.20	30.10	—.06	—1.0	+ 4.9	8.4	—10.3	0.85	+0.47	8.5
Kingston, Ont.	29.66	30.00	—.08	19.6	+ 2.5	28.0	11.3	1.33	—1.93	10.6	Kamloops, B. C.	28.79	30.14	+.04	22.8	— 0.2	29.9	15.8	0.90	+0.04	9.0
Toronto, Ont.	29.60	30.01	—.08	24.1	+ 2.7	31.5	16.7	2.47	—0.04	16.9	Victoria, B. C.	29.89	29.99	—.01	39.0	+ 0.5	43.2	34.7	4.15	—1.52	4.3
White River, Ont.	28.56	30.03	—.08	1.8	+ 2.2	18.3	—14.6	1.73	+0.40	17.3	Barkerville, N. W. T.	25.50	30.02	.....	14.9	— 2.9	22.4	7.4	4.40	+1.69	44.0
Port Stanley, Ont	29.35	30.03	—.06	24.9	+ 1.7	31.2	16.7	2.96	+0.28	18.7	Hamilton, Bermuda.	29.82	29.98	—.12	61.1	— 0.9	66.2	55.9	9.71	+4.86	
Saugeen, Ont.	29.23	29.99	—.07	22.7	+ 2.3	30.2	15.2	3.00	—0.46	29.4											

TABLE VII.—*Heights of rivers referred to zeros of gages, January, 1901.*

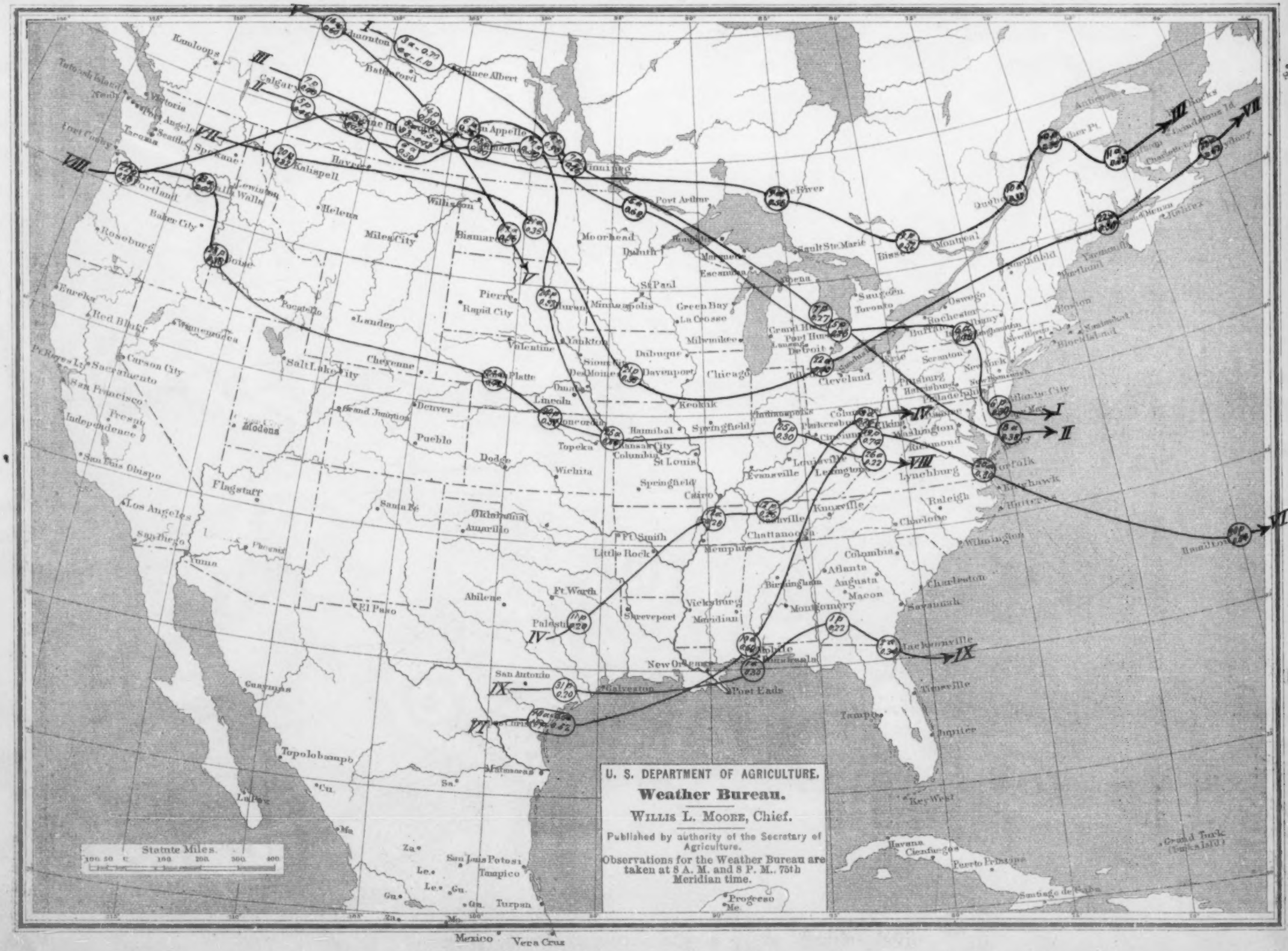
Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Mississippi River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
St. Paul, Minn. *	1,954	14	.....	.....	.....	.....	.....	.....
Reeds Landing, Minn [1]	1,884	12	1.3	3	0.2	28,30,31	0.8	1.1
La Crosse, Wis. [2]	1,819	12	4.4	6,7	2.9	19	3.7	1.5
Prairie du Chien, Wis. *	1,759	18	.....	.....	.....	.....	.....	.....
Dubuque, Iowa. *	1,699	15	.....	.....	.....	.....	.....	.....
Leclaire, Iowa. *	1,609	10	.....	.....	.....	.....	.....	.....
Davenport, Iowa [1]	1,593	15	7.1	20	2.0	1	4.6	5.1
Muscatine, Iowa	1,562	16	6.0	7	3.1	1	4.8	2.9
Galland, Iowa	1,472	8	1.8	11,12	1.0	1-5,7-9	1.3	0.8
Keokuk, Iowa	1,463	15	3.5	5	— 0.1	1,2	1.8	3.6
Hannibal, Mo	1,402	13	3.4	16	— 0.4	3,4	2.0	3.8
Grafton, Ill	1,306	23	5.3	21-23	2.2	6	4.3	3.1
St. Louis, Mo	1,264	30	5.7	15,18	0.6	7	4.0	5.1
Chester, Ill	1,189	35	3.8	16	0.0	9	2.4	3.8
Memphis, Tenn	843	33	18.8	24	6.3	1,14	10.6	12.5
Helena, Ark	767	42	24.7	25	10.2	1	15.7	14.5
Arkansas City, Ark	635	42	25.7	26	12.9	2,8,9	17.3	12.8
Greenville, Miss	595	42	21.5	27	10.3	2,3,8-10	14.0	11.2
Vicksburg, Miss	474	45	23.9	28	10.9	9,10	15.2	13.0
New Orleans, La	108	16	8.0	30	4.2	7,8	5.6	3.8
Missouri River.								
Bismarck, N. Dak	1,309	14	3.3	1,2	0.8	21	1.9	2.5
Pierre, S. Dak. *	1,114	14	.....	.....	.....	.....	.....	.....
Sioux City, Iowa *	784	19	.....	.....	.....	.....	.....	.....
Omaha, Nebr	669	18	6.7	21,22,24,25	3.0	1	5.8	3.7
St. Joseph, Mo	481	10	0.7	25,29-31	— 3.1	2	—0.4	3.8
Kansas City, Mo	388	21	6.8	23	3.7	11	5.3	3.1
Boonville, Mo	199	20	6.5	3	3.6	15	4.7	2.9
Hermann, Mo	103	24	5.8	13	2.1	7	4.1	3.7
Illinois River.								
Peoria, Ill	135	14	9.2	17,24,25	7.7	5-9	8.5	1.5
Youghiogheny River.								
Confluence, Pa	59	10	4.2	12	0.7	5-9	1.8	3.5
West Newton, Pa	15	25	5.8	13	0.7	6	2.2	5.1
Allegheny River.								
Warren, Pa	177	14	5.1	13	1.3	9	2.6	3.8
Oil City, Pa	123	13	9.0	11	1.5	8,9	3.1	7.5
Parker, Pa	73	20	7.2	13	1.4	6-8	3.2	5.8
Monongahela River.								
Weston, W. Va	161	18	3.3	12	0.0	{4-10,16-19,21}	0.5	3.3
Fairmont, W. Va	119	25	7.8	13	1.2	9,10	2.4	6.6
Greensboro, Pa	81	18	12.5	13	7.5	8	8.7	5.0
Lock No. 4, Pa	40	28	15.5	13	7.2	10,21	9.0	8.3
Conemaugh River.								
Johnstown, Pa	64	7	3.8	11	1.2	6-8	2.3	2.6
Red Bank Creek.								
Brookville, Pa	35	8	2.4	12	1.4	1-9	1.8	1.0
Beaver River.								
Ellwood Junction, Pa. [3]	10	14	4.6	12,13	3.1	18	3.7	1.5
Great Kanawha River.								
Charleston, W. Va	61	30	17.0	13	4.6	22,29	6.9	12.4
Little Kanawha River.								
Glenville, W. Va	100	24	3.9	12	— 1.4	9,10	1.5	5.3
New River.								
Hinton, W. Va	95	14	7.3	13	1.8	8-10	2.8	5.5
Cheat River.								
Rowlesburg, W. Va. [4]	36	14	5.6	12	3.0	20	4.0	2.6
Ohio River.								
Pittsburg, Pa	966	22	12.5	14	2.0	8	5.3	10.5
Davis Island Dam, Pa	960	25	13.0	13	4.0	6-8	6.8	9.0
Wheeling, W. Va	875	36	18.0	14	4.4	9	8.4	13.6
Parkersburg, W. Va	785	36	17.8	15	3.5	7	8.8	14.3
Point Pleasant, W. Va	703	39	22.6	15	4.2	11	9.9	18.4
Huntington, W. Va	660	50	26.6	15	7.5	11	13.7	19.1
Catlettsburg, Ky	651	50	26.2	15	6.0	11	13.1	20.2
Portsmouth, Ohio	612	50	27.5	16	7.4	11	14.0	20.1
Cincinnati, Ohio	499	50	28.8	17	9.6	11	15.8	19.2
Madison, Ind	413	46	24.0	17	9.6	11	14.4	14.4
Louisville, Ky	367	28	10.5	17,18	5.7	11	7.6	4.8
Evansville, Ind	184	35	21.1	20	8.7	12	12.8	12.4
Paducah, Ky	47	40	24.2	21	9.6	11	14.9	14.6
Cairo, Ill	1,073	45	35.8	21	11.7	12	17.6	15.1
Muskingum River.								
Zanesville, Ohio	70	20	11.6	13	6.6	5	8.0	5.0
Scioto River.								
Columbus, Ohio [5]	110	17	5.2	12,13	2.8	18,21-24	3.4	2.4
Miami River.								
Dayton, Ohio	69	18	3.4	12	0.9	3-6	1.6	2.5
Wabash River.								
Mount Carmel, Ill.	50	15	7.2	15,16	2.2	5-7	3.9	5.0
Licking River.								
Falmouth, Ky	30	25	7.2	1,13	1.8	29-31	3.8	5.4
Clinch River.								
Speers Ferry, Va	156	20	10.2	12	0.1	5,6	1.3	10.1
Clinton, Tenn	46	25	20.5	13	4.2	9,10	7.2	16.3
Tennessee River.								
Knoxville, Tenn	614	29	16.0	13	1.5	9,10	4.0	14.5
Kingston, Tenn	534	25	16.7	13	1.9	10	4.8	14.8
Chattanooga, Tenn	430	33	30.0	14	3.8	10	8.7	26.2
Bridgeport, Ala	390	24	20.5	14,15	2.3	10	6.5	18.2
Florence, Ala	220	16	16.2	16,17	3.0	10	7.5	13.2
Riverton, Ala	190	25	25.4	17	3.6	10	10.9	21.8
Johnsonville, Tenn	94	21	24.0	19	5.6	10	12.6	18.4

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Cumberland River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Burnside, Ky	434	50	28.3	13	2.2	30	6.7	26.1
Carthage, Tenn	257	40	24.8	15	4.0	10	8.6	20.8
Nashville, Tenn	175	40	27.4	16	6.7	10	12.6	20.7
Clarksville, Tenn	138	42	30.4	17	9.6	10	16.0	20.8
Arkansas River.								
Wichita, Kans	726	10	1.9	16-25	1.5	1	0.4	0.4
Webbers Falls, Ind. T	413	23	4.0	14	1.9	9-11	2.4	2.1
Fort Smith, Ark	351	22	5.1	15	2.5	31	3.1	2.6
Dardanelle, Ark	256	21	4.8	17	2.4	8,9	3.2	2.4
Little Rock, Ark	176	23	7.0	14	3.6	31	5.1	3.4
White River.								
Newport, Ark	150	26	6.7	16	3.3	10,30,31	4.4	3.4
Yazoo River.								
Yazoo City, Miss	80	25	18.3	11	11.8	1	14.3	6.5
Red River.								
Arthur City, Tex. [6]	688	27	4.7	15,16	4.6	17-31	4.6	0.1
Fulton, Ark	565	28	7.6	14	4.3	31	5.9	3.3
Shreveport, La	449	29	6.8	18	2.0	11	4.3	4.8
Alexandria, La	139	33	7.8	14	0.9	10	4.7	6.9
Ouachita River.								
Camden, Ark	340	39	23.2	14	7.1	30	11.9	16.1
Monroe, La	100	40	18.1	24,25	12.5	10	15.7	5.6
Atchafalaya River.								
Melville, La	100	31	23.9	30,31	15.0	7-11	18.9	8.9
Susquehanna River.								
Wilkesbarre, Pa	178	14	11.5	16	7.5	29-31	8.4	4.0
Harrisburg, Pa	70	17	3.5	15	1.2	8	2.0	2.3
W. Br. of Susquehanna.								
Williamsport, Pa	35	20	4.5	14	1.0	5,6	2.4	3.5
Juniata River.								
Huntingdon, Pa. [7]	80	24	4.3	12	3.0	1-3,9-11	3.5	1.3
Potomac River.								
Harpers Ferry, W. Va	170	16	4.4	14	1.9	4-10	2.7	2.5
James River.								
Lynchburg, Va	257	18	7.2	13	0.5	5-10	1.6	6.7
Richmond, Va	110	12	6.5	13	— 1.2	21-24	—0.1	7.7
Roanoke River.								
Weldon, N. C.	90	40	30.7	14	8.3	8-11	11.2	22.4
Cape Fear River.								
Fayetteville, N. C.	100	38	15.4	14	4.0	9	7.3	11.4
Edisto River.								
Edisto, S. C.	75	6	5.9	7	4.3	31	5.0	1.6
Pedee River.								
Cheraw, S. C.	145	27	22.6	14	2.1	11	5.8	20.5
Black River.								
Kingstree, S. C	60	12	11.2	7	7.7	1	9.1	3.5
Lynch Creek.								
Effingham, S. C.	35	12	10.6	8	5.8	16	8.1	4.8
Santee River.								
St. Stephens, S. C.	50	12	8.7	8-12,25	7.9	17-19,31	8.4	0.8
Congaree River.								
Columbia, S. C.	37	15	5.1	14	0.4	9,10	1.8	4.7
Wateree River.								
Camden, S. C.	45	24	22.0	14	4.8	11	8.6	17.2
Waccamaw River.								
Conway, S. C.	40	7	5.8	6-8	4.0	1,29-31	5.0	1.8
Savannah River.								
Calhoun Falls, S. C.	347	.....	6.0	13	3.1	28,29	3.7	2.9
Augusta, Ga	208	32	23.5	13	8.4	10	11.9	15.1
Broad River.								
Carlton, Ga	30	.....	11.5	13	2.6	9,10	3.8	8.9
Flint River.								
Albany, Ga	80	20	18.1	4	4.0	31	9.6	14.1
Chattahoochee River.								
Westpoint, Ga	239	20	15.0	13	3.8	10	6.1	11.2
Ocmulgee River.								
Macon, Ga	125	20	13.7	3	4.3	21	7.4	9.4
Oconee River.								
Dublin, Ga	60	30	13.9	6,7	4.6	25	8.4	9.3
Coosa River.								
Rome, Ga	225	30	27.0	13	2.8	10	8.3	24.2
Gadsden, Ala	144	18	22.4	13	3.2	10	9.9	19.2
Alabama River.								
Montgomery, Ala	265	35	37.7	15	6.8	11	18.3	30.9
Selma, Ala	212	35	40.0	17	8.1	11	22.7	31.9
Tombigbee River.								
Columbus, Miss	303	33	23.7	15	0.0	9	8.5	22.7
Demopolis, Ala. [8]	155	35	49.6	21	8.7	10	30.4	40.9
Black Warrior River.								
Tuscaloosa, Ala	129	43	56.5	13	8.3	10	22.8	[8]8.2
Brazos River.								
Kopperl, Tex	369	21	— 0.1	1-5	— 0.2	6-31	—0.2	0.1
Waco, Tex	301	22	1.1	1-7	0.9	22-31	1.0	0.2
Columbia River.								
Umatilla, Oreg	270	25	5.5	1	2.5	31	3.7	3.0
The Dalles, Oreg	166	40	9.4	14,15	5.1	12	6.9	4.3
Willamette River.								
Albany, Oreg	90	20	30.5	15	5.6	31	10.4	24.9
Portland, Oreg	10	15	20.9	17	3.8	31	9.2	17.1
Sacramento River.								
Red Bluff, Cal.	241	23	19.4	4	4.3	29-31	8.1	15.1
Sacramento, Cal	70	29	22.7	16	16.0	3,4	21.5	6.7

Frozen. [1] Frozen for 2 days. [2] Frozen for 3 days. [3] Frozen for 20 days. [4] Frozen for 5 days. [5] Frozen for 19 days. [6] 17 days only. [7] Frozen for 17 days. [8] 30 days only.

Chart I. Tracks of Centers of High Areas. January, 1901

Chart I. Tracks of Centers of High Areas. January, 1901.


Barkerville
Kamloops
Tatoosh Island
Victoria
Port Angeles
Seattle
Tacoma
Spokane
Kalispell
Portland
Baker City
Roseburg
Eureka
Red Bluff
Winnemucca
Carson City
Sacramento
San Francisco
Fresno
Independence
Modena
San Luis Obispo
Flagstaff
Los Angeles
San Diego
Yuma
Phoenix
Santa Fe
Oklahoma
Amarillo
El Paso
Abilene
Ft Worth
Palestine
San Antonio
Galveston
Port Eads
Brownsville
Matamoras
Topolobampo
La Paz
Mazatlan
San Luis Potosi
Tampico
Monterey
Laredo
Eagle Pass
Presidio
Chihuahua
Durango
Zacatecas
Guaymas
Mexico
Vera Cruz
Turpan
Havre
Helena
Miles City
Bismarck
Williston
Lewiston
Baker City
Boise
Pocatello
Lander
Cheyenne
Salt Lake City
Denver
Grand Junction
Pueblo
Dodge
Wichita
Santa Fe
Oklahoma
Amarillo
Topeka
Kansas City
Columbia
St Louis
Springfield
Cairo
Ft Smith
Little Rock
Memphis
Vicksburg
Shreveport
Meridian
New Orleans
Mobile
Pensacola
Tallahassee
Jacksonville
Tampa
Key West
Havana
Cienfuegos
Puerto Principe
Santiago de Cuba
Progreso
Merida
Tuxpan
Tampico
Laredo
Eagle Pass
Presidio
Chihuahua
Durango
Zacatecas
Guaymas
Topolobampo
La Paz
Mazatlan
San Luis Potosi
Tampico
Monterey
Mexico
Vera Cruz
Calgary
Battleford
Prince Albert
Qu'Appelle
Winnipeg
Port Arthur
Duluth
Moorhead
Minneapolis
St Paul
Pierre
Rapid City
Valentine
Yankton
Sioux City
Des Moines
Dubuque
Davenport
Chicago
Milwaukee
Green Bay
La Crosse
Escanaba
Marquette
Sault Ste Marie
Parry Sound
Sudbury
Toronto
Owen Sound
Port Huron
Detroit
Cleveland
Buffalo
Rochester
Oswego
Syracuse
Albany
Utica
Binghamton
Scranton
Harrisburg
Philadelphia
Atlantic City
New York
Boston
Portland
Yarmouth
Quebec
Father Point
Anticosti
Magdalen Is
Charlottetown
Sydney
Halifax
St John
Grand Manan
Eastport
Bar Harbor
Portland
Concord
Burlington
Montreal
Ottawa
Kingston
Belleville
Port Hope
Toronto
Hamilton
Niagara Falls
Buffalo
Erie
Cleveland
Columbus
Cincinnati
Indianapolis
Springfield
Evansville
Louisville
Lexington
Knoxville
Chattanooga
Nashville
Memphis
Little Rock
Ft Smith
Atlanta
Augusta
Macon
Columbia
Charleston
Savannah
Jacksonville
Tallahassee
Pensacola
Mobile
Montgomery
Birmingham
Vicksburg
Meridian
Shreveport
Ft Worth
Abilene
Palestine
Galveston
Port Eads
New Orleans
Brownsville
Matamoras
Monterey
Laredo
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Zacatecas
Guaymas
Topolobampo
La Paz
Mazatlan
San Luis Potosi
Tampico
Mexico
Vera Cruz
Progreso
Merida
Tuxpan
Havana
Cienfuegos
Puerto Principe
Santiago de Cuba
Key West
Tampa
Jupiter
Tallahassee
Jacksonville
Savannah
Charleston
Wilmington
Raleigh
Charlotte
Knoxville
Lynchburg
Norfolk
Richmond
Washington
Baltimore

Chart II. Tracks of Centers of Low Areas. January, 1901.

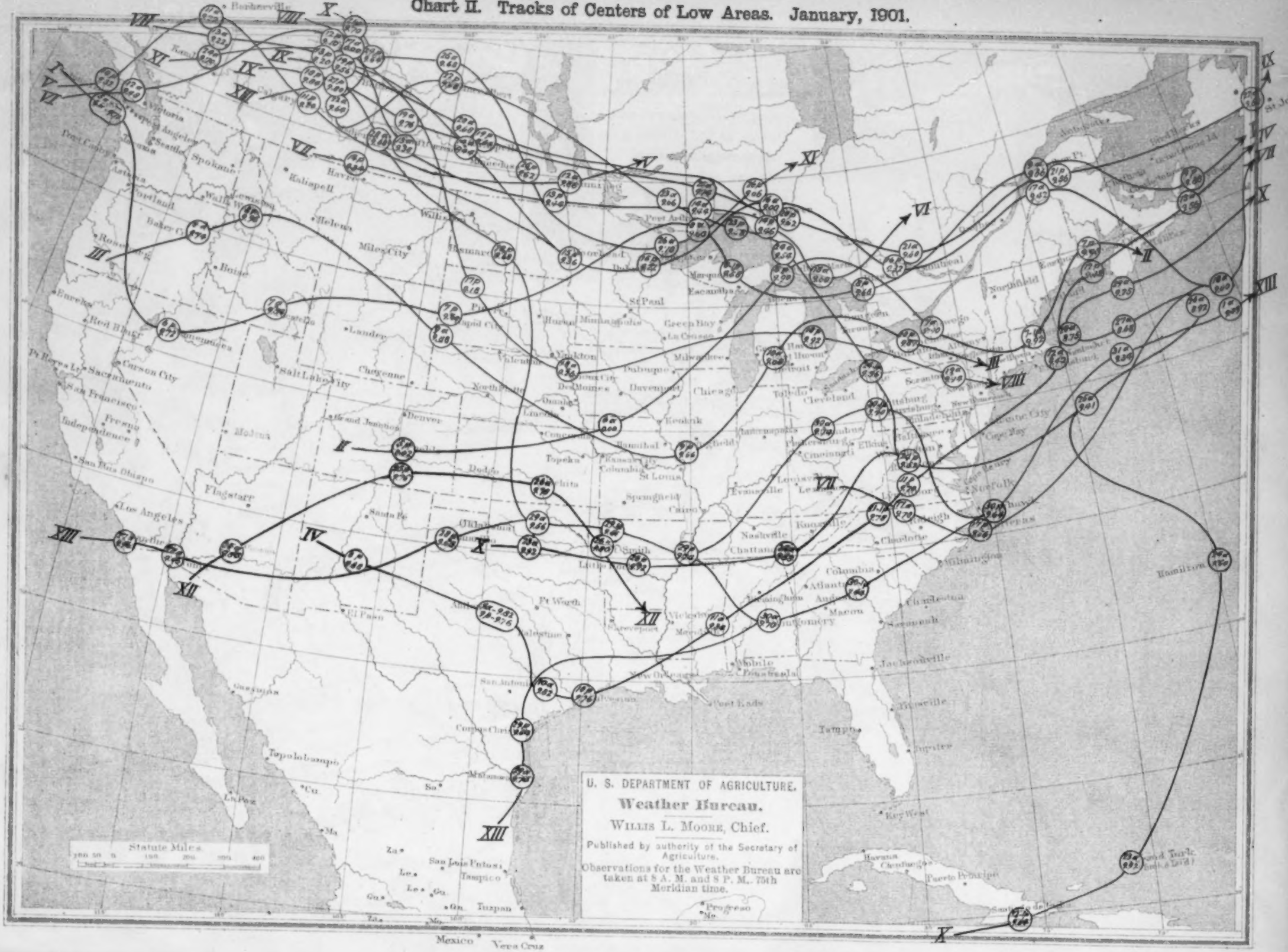
Statute Miles
U. S. DEPARTMENT OF AGRICULTURE.
Weather Bureau.
Willis L. Moore, Chief.
Published by authority of the Secretary of Agriculture.
Observations for the Weather Bureau are taken at 8 A. M. and 8 P. M., 75th Meridian time.

Chart III. Total Precipitation. January, 1901.

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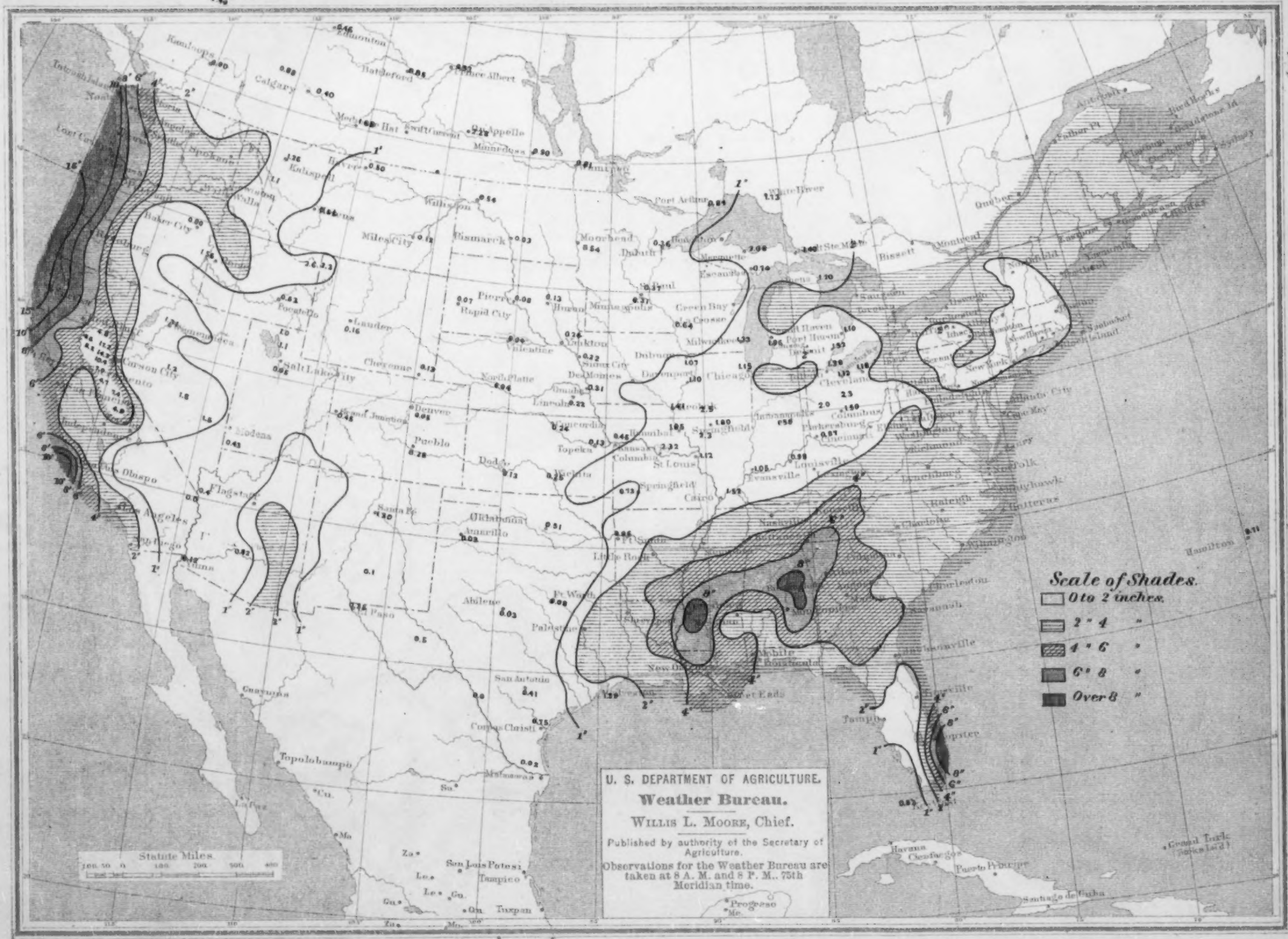


Chart IV. Sea-Level Pressure and Temperature; Resultant Surface Winds. January, 1901.

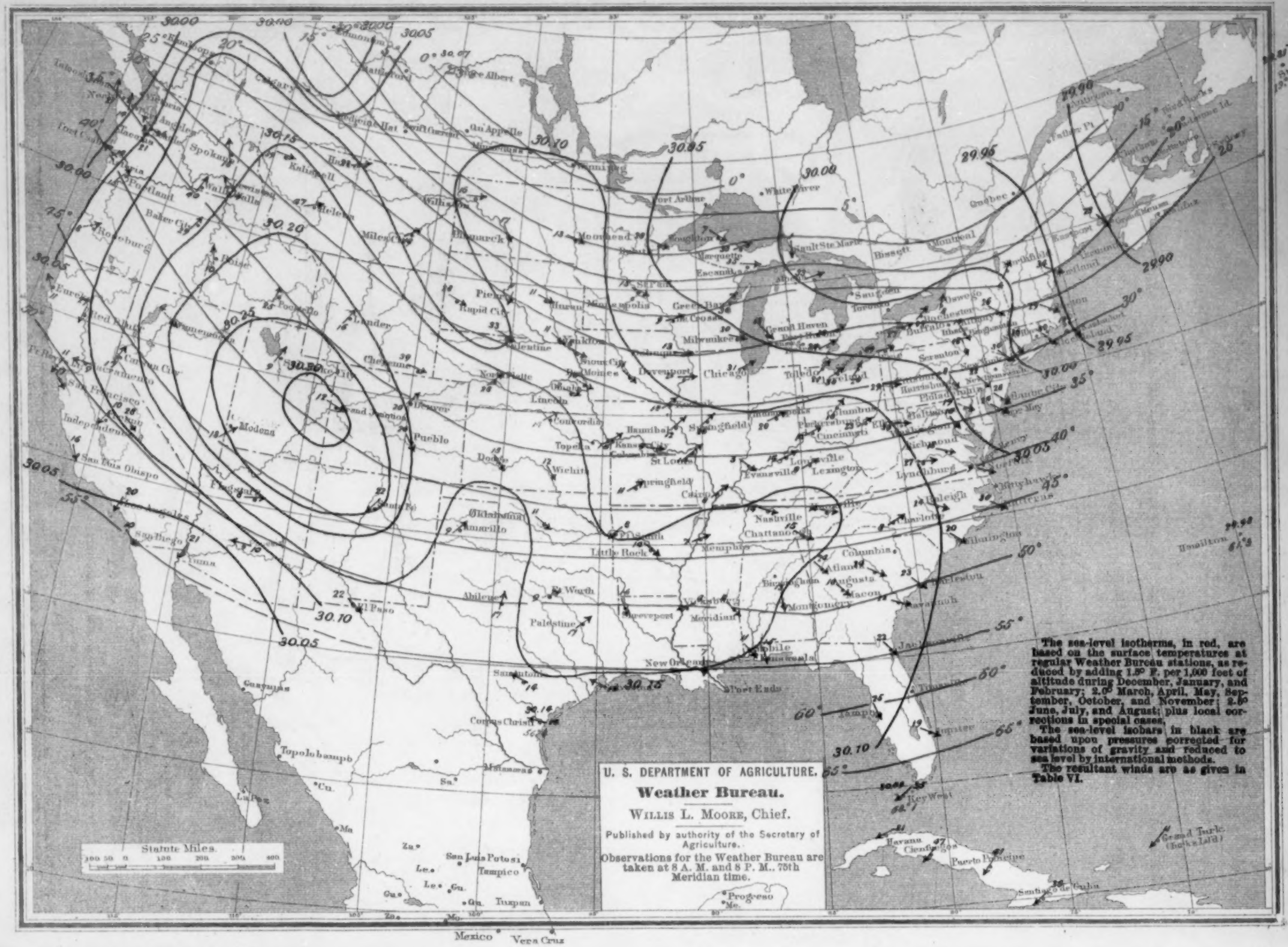

Statute Miles.
100 50 0 100 200 300 400
U. S. DEPARTMENT OF AGRICULTURE.
Weather Bureau.
WILLIS L. MOORE, Chief.
Published by authority of the Secretary of Agriculture.
Observations for the Weather Bureau are taken at 8 A. M. and 8 P. M., 75th Meridian time.
The sea-level isotherms, in red, are based on the surface temperatures at regular Weather Bureau stations, as reduced by adding 1.8° F. per 1,000 feet of altitude during December, January, and February; 2.0° March, April, May, September, October, and November; 2.6° June, July, and August; plus local corrections in special cases.
The sea-level isobars, in black are based upon pressures corrected for variations of gravity and reduced to sea level by international methods.
The resultant winds are as given in Table VI.
Mexico
Vera Cruz

Chart V. Hydrographs for Seven Principal Rivers of the United States. January, 1901.

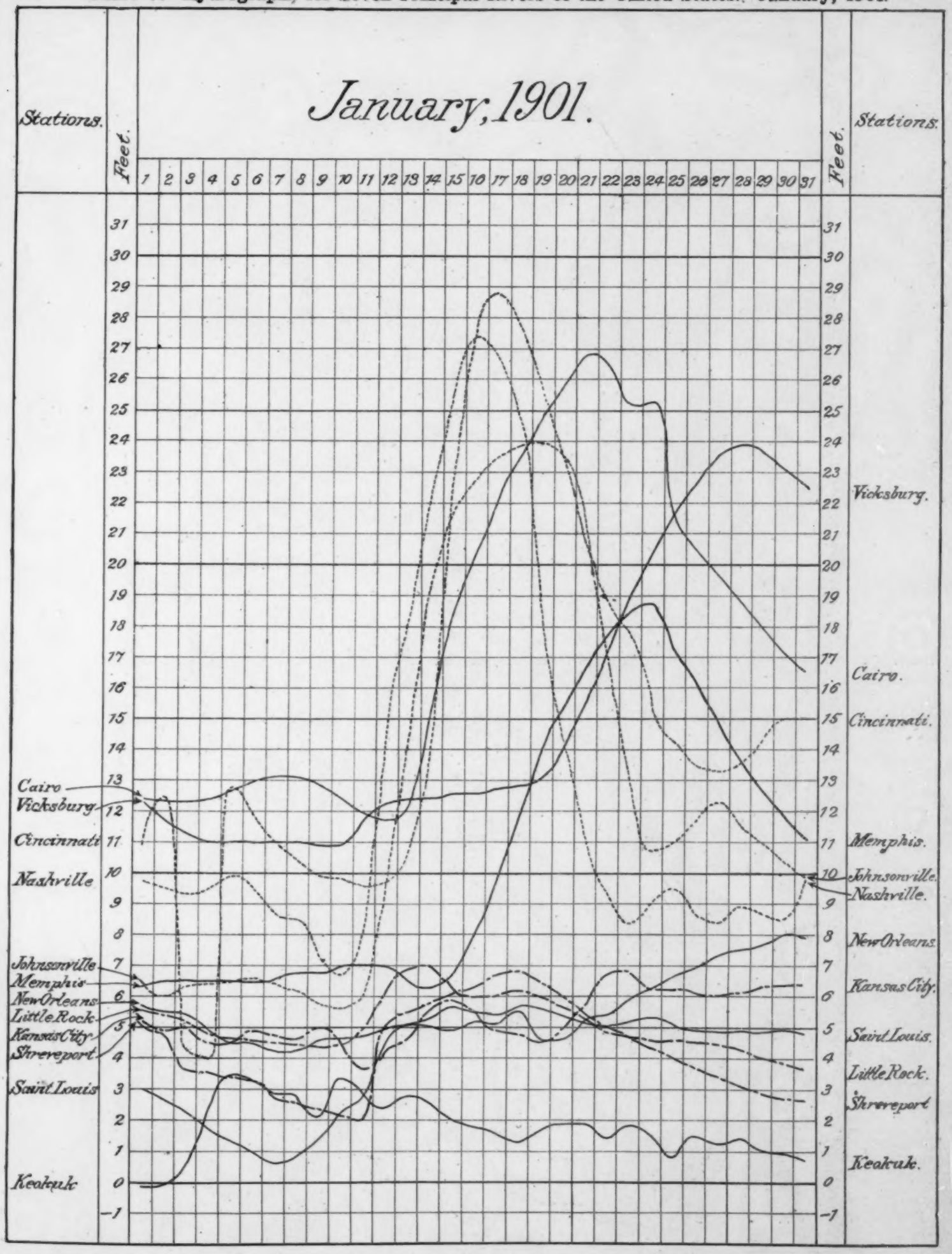
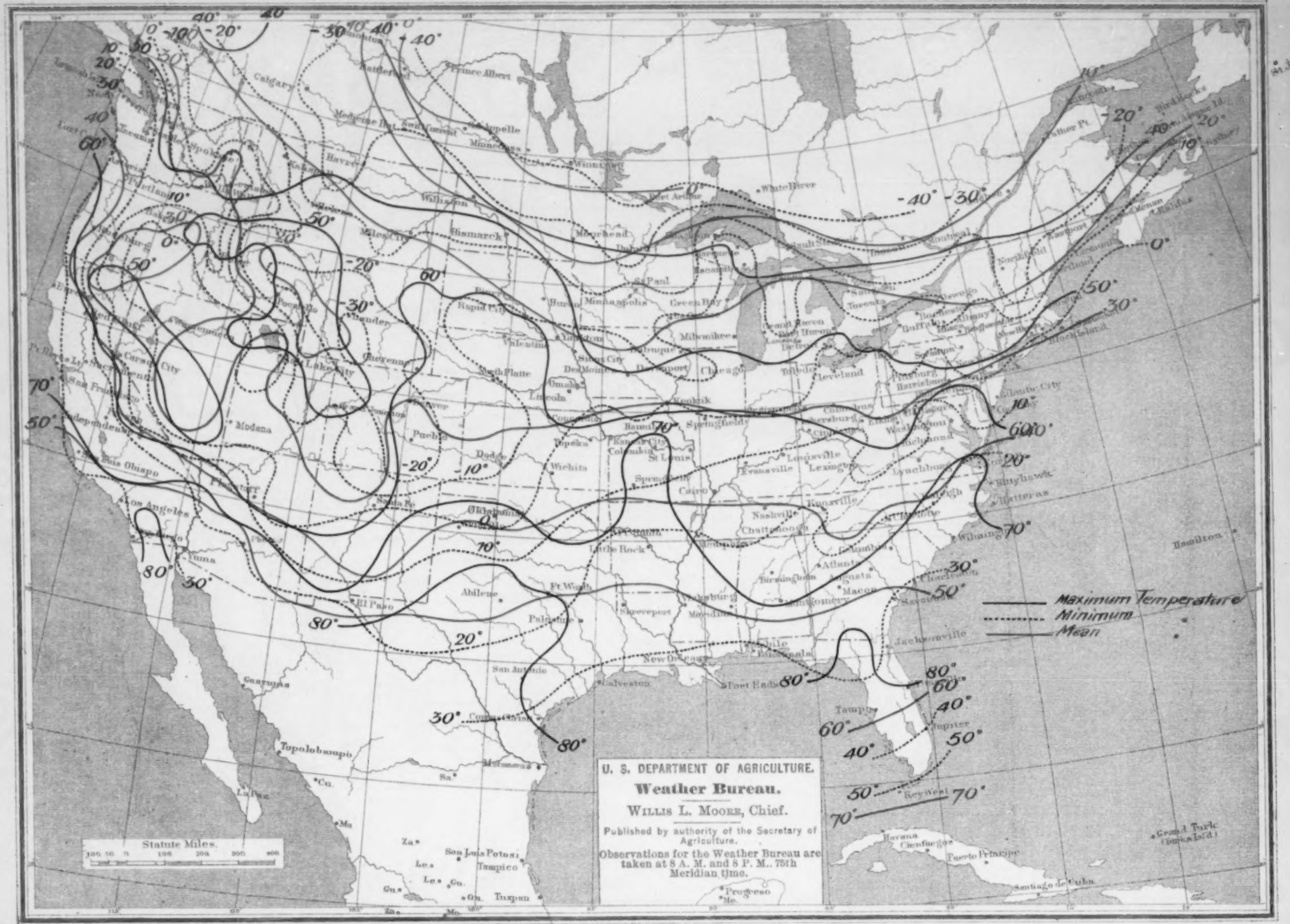


Chart VI. Surface Temperatures; Maximum, Minimum, and Mean. January, 1901.


Maximum Temperature
Minimum
Mean
Statute Miles.
U. S. DEPARTMENT OF AGRICULTURE.
Weather Bureau.
Willis L. Moore, Chief.
Published by authority of the Secretary of Agriculture.
Observations for the Weather Bureau are taken at 8 A. M. and 8 P. M., 75th Meridian time.

Baskerville

Chart VII. Percentage of Sunshine. January, 1901.

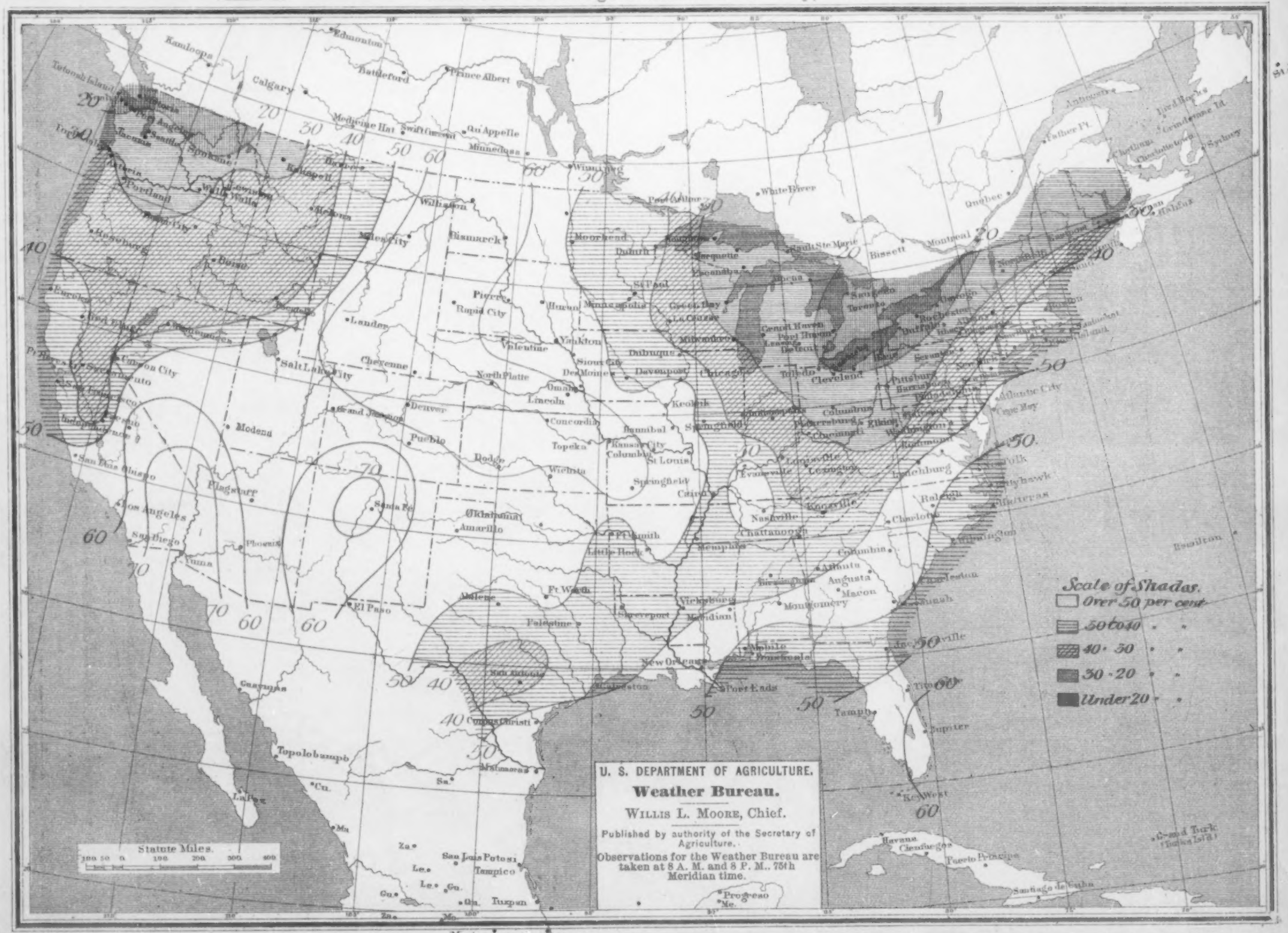


Chart VIII. West Indian Monthly Isobars, Isotherms, and Resultant Winds. January, 1901.

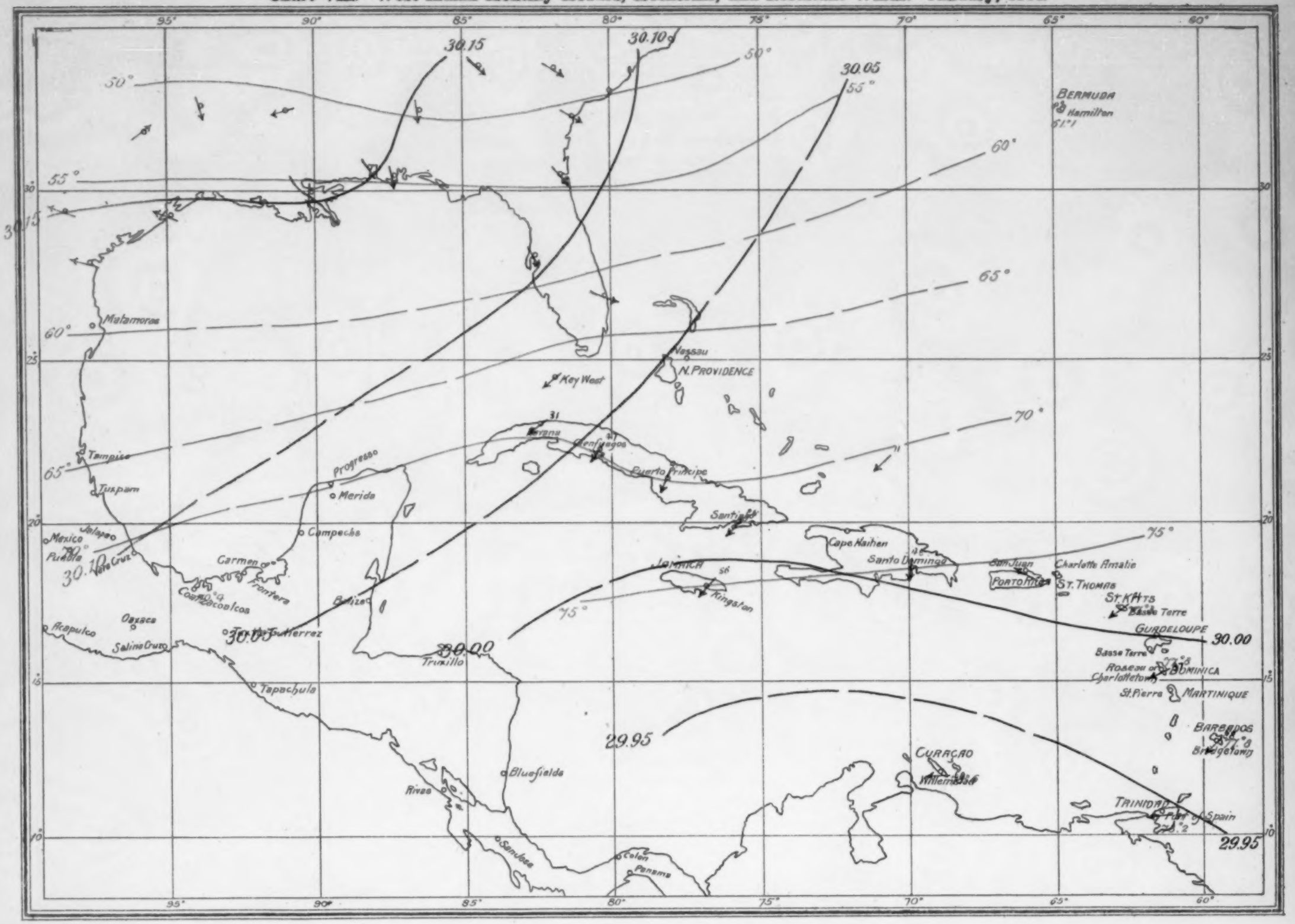


Chart IX. Total Snowfall for January, 1901.

Chart IX. Total Snowfall for January, 1901.

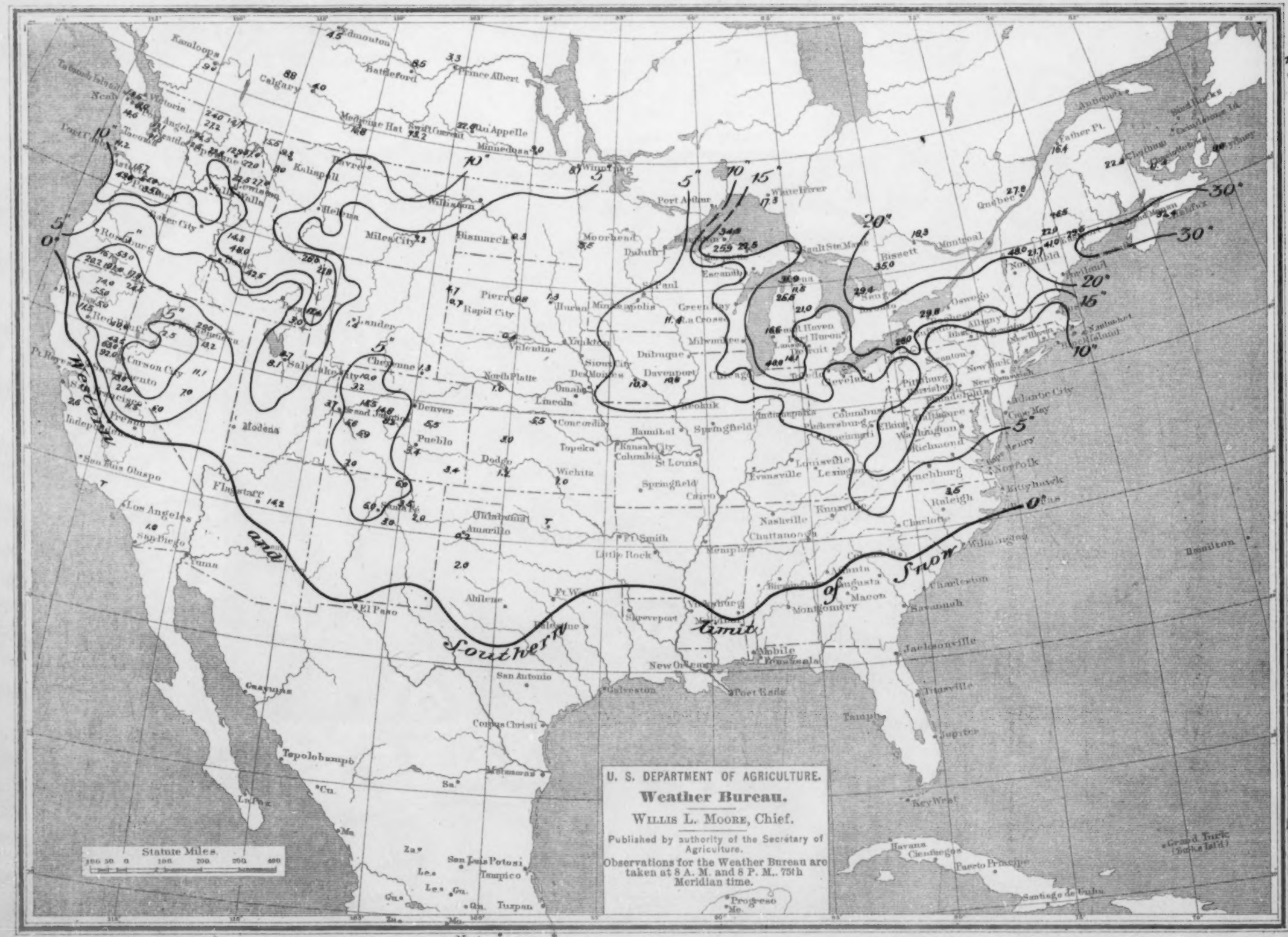


Chart X. Depth of Snow on Ground January 31, 1901.

Northern limit
Southern limit
Statute Miles.
U. S. DEPARTMENT OF AGRICULTURE.
Weather Bureau.
WILLIS L. MOORE, Chief.
Published by authority of the Secretary of Agriculture.
Observations for the Weather Bureau are taken at 8 A. M. and 8 P. M., 75th Meridian time.

Plate I.

Fog Studies. Fog Lifting. View from U. S. Weather Bureau Observatory, Mount Tamalpais, Cal.

Plate II.

Fog Studies. Helmholtzian Fog Billow. View from U. S. Weather Bureau Observatory, Mount Tamalpais, Cal.